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# *Proceedings of the Davenport Academy of Natural Sciences*

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OF THE

# DAVENPORT ACADEMY

## NATURAL SCIENCES.

VOLUME VII.

1897 - 1899.

DAVENPORT, IOWA.

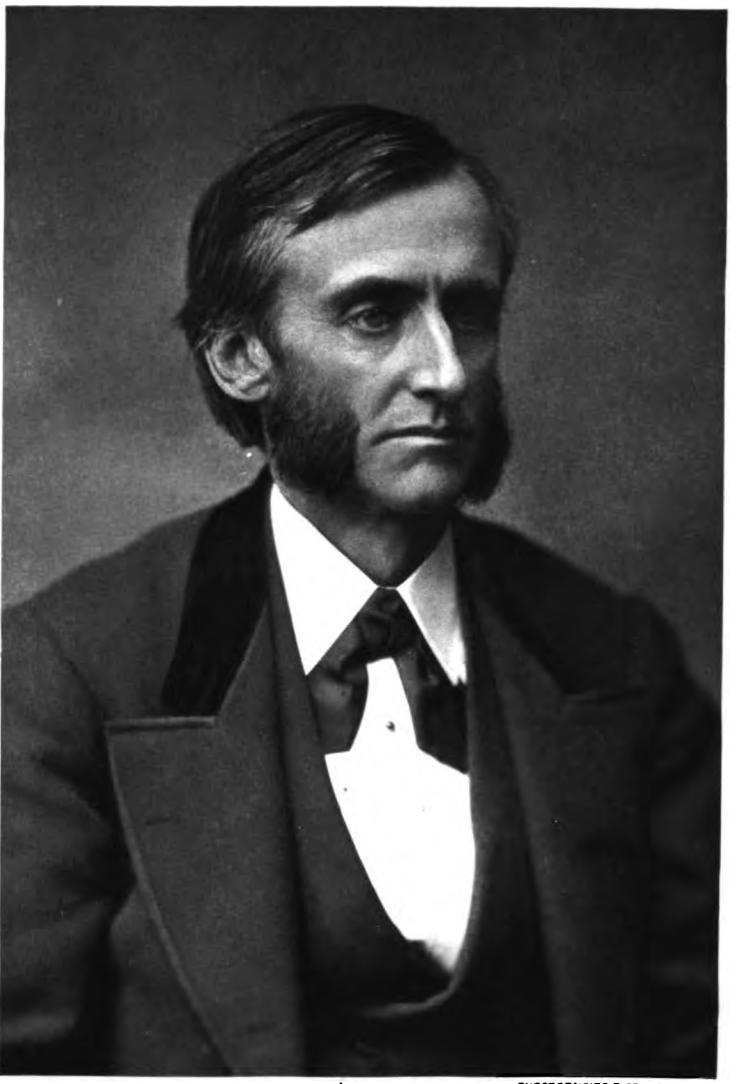
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charles E. Putnam

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The authors of the various papers are alone responsible for what is contained in them.  
The date of printing each form is given in the signature line.

EDWARD BORCHFRDT, PRINTER.

## PREFACE.

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THE Publication Committee of the Davenport Academy of Natural Sciences takes pleasure in presenting to the scientific world the seventh volume of its proceedings.

For the first time in many years considerable space has been given to entomological papers. This is eminently fitting in view of the fact that the publication was started by J. Duncan Putnam, whose entomological contributions added much to the value of the first three volumes. The present volume contains valuable entomological papers by Samuel H. Scudder, Herbert Osborn, Elmer D. Ball, T. D. A. Cockerell, and H. F. Wickham.

The departments of anthropology and ethnology, in which the Academy takes a deep interest on account of its large and constantly increasing collections in these lines, are represented by three papers by Frederick Starr.

There is also a paper on Scott county geology by Professor W. H. Barris and botanical contributions by L. H. Pammel and H. Harold Hume.

The volume is opened by a biographical sketch of Charles E. Putnam, one of the early supporters of the Academy and twice its President. This memoir is written by his son, W. C. Putnam.

The membership lists at the close of the volume were prepared by Dr. C. H. Preston, and the index by J. G. Udden, Jr., of Rock Island, to whom, and to Edward Borcherdt for the pains taken with typography and press-work, the thanks of the Academy are due. The volume is illustrated by plates of a high grade, much enhancing its value.

While the Academy is chiefly known to the outside world by its published proceedings, material progress has been made at home.

Both the library and the museum have been steadily growing through gift and exchange, and the recent purchase of the adjoining church property will temporarily supply the urgent need for more room.

Since the establishment of the Putnam memorial fund it has been possible to publish to better advantage than formerly. Already work has been commenced on Vol. VIII. of the Proceedings. A valuable paper by Samuel H. Scudder on the Orthoptera of the United States and Canada is now in the hands of the printer. This will be followed by an entomological paper by Frederick Starr. With these articles and others that have been promised the value of the volume is assured.

DAVENPORT, December 30, 1899.

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# Charles Edwin Putnam



APR 28 1900

## CHARLES EDWIN PUTNAM

### A MEMOIR

BY WILLIAM CLEMENT PUTNAM

JUST west of the village of Saratoga Springs, New York, rises "Prospect Hill," above a broad and beautiful valley, and commanding a fine panorama of field, forest, and mountain. In a commodious residence on this noble site there dwelt, in the early part of this century, Benjamin Risley Putnam and Eunice Morgan Putnam, his wife. Here Charles Edwin, the fifth of seven children, was born on February 19th, 1825. The only survivor of this family at present is the youngest brother, Hon. John R. Putnam, a Justice of the Appellate Division of the Supreme Court of New York, who resides in a modern mansion built on the old family estate.

The home at "Prospect Hill" had been founded, not long after the close of the Revolutionary War, by the pioneer settler of Saratoga, Gideon Putnam, the father of Benjamin R. Gideon had, at the age of nineteen, purchased his majority from his father, and soon afterward pushed into the wilderness, with his young wife and child, to do what lay in his power to open up and develop the country which had been won from England by the war. He laid out the village, opened the since world-famous mineral springs, built hotels to accommodate the people who began to be attracted thither in the pursuit of health and pleasure, and gave lands for the establishment of parks, churches, schools, and a cemetery. He represented the highest type of those public-spirited and energetic founders of commonwealths, of which our country has produced so many brilliant examples. Gideon was of

the fifth generation from John Putnam, the founder of the family in America, who settled in Salem, Massachusetts, in 1634. Gideon's ancestors for more than twenty generations had been landowners in England and New England. He was the nephew of General Rufus Putnam, the distinguished chief engineer officer of the American Army through the Revolution, who in 1788, about the time that his nephew was founding Saratoga, led a band of former officers of the Continental Army and their families across the mountains and down the Ohio River to establish at Marietta the first settlement made by Americans in the new Northwest Territory, thus laying the corner-stone of that vast structure of prosperous states which in the present century has covered the entire Mississippi Valley with its teeming millions. He was one of the Justices of the first Supreme Court of the Northwest Territory, and was afterwards appointed by President Washington a commissioner to negotiate treaties with the Indians, and later the first Surveyor-General of the United States, a position he held for ten years, during which he originated our present simplified system of government land surveys. He filled many other positions of honor and trust, and at his death in 1824 was, with the single exception of La Fayette, the last survivor of the general officers of the Revolutionary Army. General Rufus Putnam was a cousin of General Israel Putnam, "Old Put," the beau ideal of American soldiers, hero of the French and Indian and Revolutionary Wars, and one of the clarion names in history.

It may be of interest to add that among the English ancestors of this family was Sir George Puttenham, who in 1589 published "The Art of English Poesie," one of the first and most important works in English literary criticism. Modern representatives of the family in the field of literature include George P. Putnam, the author and publisher, George Haven Putnam, Professor Frederick W. Putnam, and others, and among jurists, Judges James Putnam and Samuel Putnam of Massachusetts, and William L. Putnam of Maine.

Charles E. Putnam thus started in life with the heritage of an honorable ancestry. Delicate in constitution, studious by habit, genial and social in disposition, gifted with a mind of the highest order, he grew to manhood under the refining and broadening influences of an unusually intellectual and social community. For Saratoga, though but a village, was then for a portion of every year the home, as perhaps no other American community has since been, of most of the men famous in our literature, politics, art, and commerce, with many

of whom, as a young man, he was thrown into close association. The centre of much of this social and intellectual life during all this period was "Pine Grove," the well-known home of Reuben H. Walworth, the last of the Chancellors of New York. "Pine Grove" was always another home for Mr. Putnam while he remained in Saratoga, and Chancellor Walworth a second father. His formal education was limited to the private schools and academies of the village. After the early death of his father, and in order to be with his mother, to whom he was much attached, he relinquished a cherished plan he had formed of securing a higher education at Union College. But from his earliest childhood he supplemented the education derived from schools by the widest range of reading and study, drinking long and deep from the fountains of learning, and reading diligently every book within his reach. For this he had unusual opportunities in the large and well-chosen library of Chancellor Walworth. Though he had come of an ancestry which for countless generations had been landowners or farmers, he had no desire to follow in their footsteps, nor indeed to enter into any occupation which should not require the constant exercise of his highest intellectual faculties.

He early developed a strong inclination to pursue a literary career, and wrote much for the local newspapers and periodicals. At this period he founded the "Coterie," a charming literary society of the young people of the village, several of the members of which afterwards became eminent in literature, law, and politics. Many papers of merit were prepared by the members and read at their meetings. In this practice of writing in his earlier years, supplementing as it did the great fund of knowledge which had been acquired by his constant reading, there was laid the foundation for the clear and polished style which characterized all of his writings in after life.

But, though the call of literature to him was strong and seductive, though he possessed a highly imaginative and poetical mind, and though it cost him a great struggle to turn aside from it, as it did Blackstone and has many another lawyer since, acting under the advice of his life-long friend, Chancellor Walworth, he finally determined to enter the legal profession. He first read law at Saratoga in the office of Beach and Bockes, the senior member of the firm being William A. Beach, subsequently a resident of New York City, and one of the most eminent of American advocates; and the junior member, Augustus Bockes, afterward for forty years a Justice of the Supreme Court of New York, who is still living in honored retirement at Saratoga. He was admitted

to the bar in May, 1847, but remained with his preceptors for two years or more. He then spent a portion of a year with an elder brother, who was practicing law in Georgia, and was afterward for a year or so in New York City, in the office of Gilbert Spier and Stephen P. Nash, both of whom have also been very distinguished members of their profession, Mr. Nash particularly having been for nearly fifty years one of the most famous estate lawyers in America. Returning to Saratoga he in 1853 met at the home of Chancellor Walworth Miss Mary L. Duncan, who later became his wife, and through her influence he soon determined to make his home in the West.

It is of this period of his life that Mrs. Ellen Hardin Walworth, the gifted historian, and a lifelong friend of the family, has written: "In the last years before the late war there was no young man better known or more kindly considered in Saratoga than Charles E. Putnam. Belonging to one of the old and honored families of the village and the state, he had grown to manhood in this community an active and lovable boy, an intellectual, genial and fascinating young man, about whom there were varied predictions. His ready smile and charming manner, combined with a slow and easy grace of movement, led the superficial observer to surmise that there was a want of energy and force in his character. Friends who were nearer to his inner life knew even then that the latent fire of a fixed purpose and the forceful will of a strong and gifted man were but casting about for a haven suited to his activities. This was soon found in the great West, where Mr. Putnam rose to eminence as a lawyer, and became one of the leading business men in a vigorous and rapidly increasing city. In the first year of his residence in the West [on December 9th, 1854, at "Elm Grove," the family homestead in Jacksonville, Illinois,] he married Mary Louis Duncan, the accomplished daughter of Governor Joseph Duncan of Illinois, one of the men who contributed largely to the welfare and progress of that state in its earlier days."

After making a tour through the West in 1853, and visiting the home of his cousin, the late Hon. William H. Clement, at Cincinnati, where he was detained for some time by a severe illness, Mr. Putnam settled in the spring of 1854 at Davenport, Iowa, entering immediately into a partnership in the practice of his profession with Judge Gilbert C. R. Mitchell, a lawyer of eminence and culture, and one of the pioneers of Iowa. From that time to the date of his death Mr. Putnam was actively engaged in the practice of the law in Davenport. His partnership with Judge Mitchell lasted for three years, when the

latter was elevated to the bench. General Joseph B. Leake, who has since become prominent in his profession in Chicago, was subsequently associated with him for a year. From 1860 to 1886 he was in partnership with Hon. John N. Rogers. The firm of Putnam and Rogers stood in the very first rank of the profession in Iowa, and indeed in the entire West. Their practice was extensive and varied, and included the argument of numerous cases in the Supreme Court of the State and in the United States Courts, and of very many in the Supreme Court of the United States. In all of these courts their arguments were received with the greatest attention, and it was a rare exception when a decision was rendered against one of their clients. Mr. Putnam in his later years gave special attention to corporation and consultation practice, and to the management of large estates and important business interests. For the last year of his life he was in partnership with his son, the writer of this memoir, who had been associated with him in his practice for the preceding seven years.

Although deeply engrossed with the practice of his profession up to the day of his death, Mr. Putnam found time to be interested in many enterprises and institutions for the advancement of the community in which he lived. He assisted in the organization and establishment in Davenport of numerous business corporations, and gave much of his time to their development, even when not pecuniarily interested. He served during many years as President of the Davenport Plow Company, the Mutual Plate Glass Insurance Company, the Oakdale Cemetery Company, and various others. He was connected with the Davenport Gas Light Company for over thirty years, and served as its President during the last twelve years of his life. During his later years especially he gave much of his time and thought to the company last named, constantly introducing new processes in the manufacture of gas, and improving and extending the works. At his suggestion, and under his direction, this was one of the first gas companies in the United States to adopt the system of lighting by electricity in addition to gas illumination. He became profoundly interested in the subject of electricity, and, as was his practice in all matters which he investigated, mastered every essential detail of the science, its literature, and its practical application to light and power.

Mr. Putnam was early impressed with the beneficent influences of savings banks, and in 1870 organized the Davenport Savings Bank, and served as its President for the ensuing fourteen years, giving during all of this period constant and daily personal attention to its manage-

ment. He prepared and drafted the Savings Bank Law of the State of Iowa, which was adopted by the Legislature with a single change permitting such banks to do a commercial business, a change which has been regarded by financiers as constituting a grave defect. This law guards the interests of depositors by the most stringent provisions, has been pronounced a model by the highest authorities, and is extensively noticed by Emerson W. Keyes, in his "History of Savings Banks." It has remained unaltered since its passage, and under its influence the savings banks of the State have been successful beyond hope or precedent, and have largely developed the thrift, prosperity, and high average of intelligence and education, for which Iowa has become so well known. In Davenport alone, with a population of about thirty thousand people, there are now (1897) nearly ten million dollars of deposits, making it pro rata one of the wealthiest cities in the Union. Mr. Putnam contributed articles to various financial journals and books upon the subject of savings banks, besides extended reports and addresses to the directors and depositors of the bank over which he presided, all displaying wide research, and evincing the deepest interest in the subject.

In 1876 Mr. Putnam was elected President of the First National Bank of Davenport. The affairs of the bank had become seriously involved, and required the skilful treatment of a firm and experienced hand. This he conscientiously gave through a portion of one year, at great personal sacrifice. After carrying the bank successfully through its troubles he felt compelled to retire, owing to the numerous other demands upon his time.

Such is a brief outline of Mr. Putnam's professional and business career. This, however, presents but one phase of his life. His early love for literature, philosophy, art, and science remained with him through life, and always occupied the supreme position in his thoughts. He continued to be a constant reader of books, in every department of literature, science, and philosophy, and gathered at his home one of the largest private libraries in the State, most of the volumes of which he read and mastered. He kept fully abreast of the thought and progress of the world in almost every line of activity, subscribing to, and examining carefully as they appeared, nearly sixty different periodicals, including almost all of the prominent scientific and literary journals. He was a thorough student of all that he read, and his mind was a great storehouse of well-arranged knowledge. He had for many years prior to his death been preparing a large amount of material for several

literary and scientific projects which he had in mind, and intended to devote the later years of his life to elaborating these and publishing the results of his labors. All of this material, representing the work of the "leisure hours" of the mature years of his life, was lost in the destruction of his home by fire six weeks prior to his death. The loss of this work preyed heavily upon him, as he felt that he must begin all over again, which at his time of life was most disheartening. And yet, characteristically, he took a cheerful view of the situation, and immediately commenced to plan for the future. For in this work was where his heart lay, and though a life of intense activity in doing more than his share in conducting the practical business of the world had prevented him from making a permanent contribution to the literature of his time, yet his mind always recurred to this cherished object of his ambition, and it was his hope that he might live to accomplish it.

Mr. Putnam took an active interest in all public educational and literary work. He served for five years as a member of the Board of Education of Davenport, introducing reforms into the methods of instruction and management of the public schools, and retained through life a deep interest in all matters pertaining to their welfare, as well as to the general cause of education in all of its phases. He served as a trustee of the Davenport Library Association, and was an active supporter of and contributor to its work. In earlier years, long before the days of "University Extension," he was instrumental in bringing many eminent lecturers to Davenport. He was a trustee of the First Presbyterian Church for a long term of years, and, although his views of religion were not bounded by any creed or sect, he was a constant attendant at its service.

During his first years at Davenport he belonged to various social and literary organizations, among others being the organizer in 1857, and President during its existence, of the Davenport Literary Society, which was one of the earliest associations of the kind in the West and had an important influence upon the growing Western town. He was also one of the founders and first President of the "Excelsior Society," composed of former residents of New York. He delivered many addresses before these and other kindred associations. He took no part in the practical work of politics. It had no attractions for him, and he never held a political office, though throughout his life he kept fully abreast of all passing political problems. Before the war he was a whig, during its continuance a unionist, and after its close a democrat with very independent proclivities, always voting for the best man

regardless of party. The only outdoor address he ever delivered was an eloquent and patriotic speech on the Fourth of July, 1860, delivered during the stress of the memorable campaign which preceded the war.

Without being a specialist in any department of science, Mr. Putnam was a conscientious and constant student in many of its branches, and gave it much of the leisure of a busy life. He became a member of the Davenport Academy of Natural Sciences in 1869, not long after its organization, serving as a trustee for fourteen years, as its Treasurer during two years, as Chairman of its Finance Committee for many more, as its President during the years 1885 and 1886, and was at the time of his death its Corresponding Secretary. He, together with his wife, had become especially interested in the Academy in order to assist the scientific life-work of their eldest son, Joseph Duncan Putnam. This son, although burdened with a fatal disease during the last eight of his brief life-span of twenty-six years, succeeded in becoming eminent not only in the special field of entomology to which he devoted himself, and which gave him a world-wide reputation, but also in putting the Academy, its active work, its museum, its library, its correspondence, and its publications, upon a permanent foundation. The sympathy between parents and son was always very strong, and in all of the projects which the latter formed for the advancement of the Academy's work and welfare, he found a friend and counselor, and a strong financial supporter, in his father. After their son's death, in 1881, Mr. Putnam and his wife continued their active participation in the work of the Academy, having a strong feeling that the different departments of this work, which the son had so largely founded, should not suffer from neglect. During the remainder of his life Mr. Putnam gave much of his time and thought to this institution and its welfare. It is owing largely to his oft-repeated and unstinted generosity, and to his wife's untiring labors, that the Academy has its permanent building, and that it has been enabled to keep up its publications and carry on its work. During his presidency he published, in the Academy Proceedings, and separately, an extended treatise upon the "Elephant Pipes and Inscribed Tablets in the Museum of the Academy of Natural Sciences, Davenport, Iowa," containing an exhaustive discussion of the scientific problems and other questions involved, and which called forth numerous letters of commendation from eminent scientists in all parts of the world. He delivered two annual addresses as President of the Academy, which are published in its Proceedings. The scientific work which he accomplished, compar-

atively limited though it was, and undertaken late in life, can at least be regarded as an index of what he was capable of doing, and of what he would undoubtedly have accomplished had his life been spared to carry out his projected undertakings. He had planned and prepared material for extensive work in the fields of archæology and ethnology, the "science of man," and his life on earth, being the subjects to which he gave much of his thought and labor during his last years.

In 1895, eight years after Mr. Putnam's decease, his widow established, largely through the assistance of a bequest from his sister, Mrs. Mary Putnam Bull, of Tarrytown, New York, a permanent fund of Ten Thousand (\$10,000.00) Dollars, to be known as the Putnam Memorial Fund, in memory of Mr. Putnam and of his son, Joseph Duncan Putnam, the income of this fund to be used toward carrying on the publications of the Academy. In view of the long and intimate association of father and son with this institution, no more appropriate memorial could have been founded, as it ensures the continuance of the important work which both had so much at heart.

But probably the most charming side of Mr. Putnam's life was that presented during the hours spent in his own home. Here, with a wife of kindred tastes and sympathies, with a family of ten sons and one daughter, to the happiness, education, and advancement of all of whom he was absolutely devoted, and surrounded by the books which served as his lifelong and intimate companions, he really lived the best part of his life, the part which he most highly prized and would least have done without. In May, 1863, he purchased and removed to an estate of eighteen acres in the outskirts of the city, commanding an extensive view of the Mississippi valley. To the embellishment of this beautiful suburban home, with its wooded avenue and its sloping lawns and vineyards, which he appropriately named "Woodlawn," in memory of the well-known estate at Saratoga adjoining his father's home, he devoted many of his leisure hours for nearly a quarter of a century. He took an active interest in the practical cultivation of trees and fruits, and his fertile and active mind was continually suggesting improvements to the estate. Here he passed the remainder of his life, always glad to return to its peaceful repose when the business of the day was over. It was a truly ideal home which he founded. Nothing that could make the home life attractive and cultivating to his children was omitted. He encouraged them while young boys in undertakings of theirs for the writing, printing, and publication of a magazine bearing the title of the "Star of Woodlawn," and of other papers; in the conducting of

a complete amateur printing office; and in the performance of private theatricals through the winter months for a number of years, played upon a regular stage with appropriate scenery and all of the accessories. He supplied them with a well-equipped carpenter and machine shop, from which were turned out rowing and sailing boats, canoes, and mechanical work of various kinds. He was a firm believer in recreation, providing his children with a billiard table and various indoor games, as well as riding horses and all kinds of outdoor paraphernalia so dear to the hearts of boys. He guided them in their reading and studies, often reading aloud to them with his rich, musical voice from the works of the best writers, having an educating influence of the highest value in the formative stage of his children's minds. Under the stimulus of his character and example the children, while very young, formed among themselves, and carried on for years, a society for historical research and study where original papers were read each week, theatrical, amusement, and stamp companies, besides conducting a juvenile savings bank, a post-office, and other institutions. He lived again in the life of each of his children, and was always interested in and sympathetic with whatever interested them.

But we are constantly reminded how temporal is everything in life. At noon on June 3rd, 1887, the fell destroyer came in the shape of fire and swept away the residence at "Woodlawn," the scene of so many years of happiness. Mr. Putnam was the only member of the family who reached the house before its total destruction. The home of twenty-four years, with much of its accumulated treasures and household gods, a large portion of his library, and all of his own and his sons' literary work and manuscripts, were devoured by the flames in an incredibly short time. The nervous shock was a terrible one to him, and the blow was deeply felt, yet his buoyant temperament at once made the best of the situation. Over the smoking ruins he began to lay plans for a future home, and never showed the white flag of discouragement.

The family moved temporarily into a cottage on the grounds. Here, six weeks later, on one of the hottest days ever experienced in this climate, Mr. Putnam was suddenly stricken down by disease. At seven o'clock in the morning of the second day afterwards, on July 19th, 1887, in the sixty-third year of his life, his soul passed peacefully into the unknown realm the mysteries of which had always had for him an absorbing though speculative interest, and the intense activities of his life were ended. His widow, six sons and one daughter survived him,

and three days later his remains were borne amid a large concourse of friends to the beautiful Oakdale Cemetery, which during his life had been a cherished object of his care.

In his death there passed from earth one of nature's true noblemen. Speaking from a long and intimate association with him, in the home and in the office, the writer can truthfully say that he was thoroughly and unfailingly honest and just in all of his dealings with his fellow-men; throughout life he treated every one with the utmost courtesy and the fairest consideration, being instinctively a gentleman in all that the term implies; he was the most generous and kind-hearted of men, and it was well-nigh impossible for him to refuse assistance even against his better judgment; he was untiringly industrious, and never neglected his duty in doing to the best of his ability any work which lay before him; he accepted the decrees of fortune, good or evil, with calm equanimity, and always courageously looked upon the hopeful side of life; he cared nothing for money except to use it for the good of others, and, instead of accumulating a fortune, spent one as he made it in ministering to the happiness of his family and friends, in the diffusion of knowledge, and in helping the poor and the distressed. With all his great talents, and notwithstanding the position he had gained in so many fields of human endeavor, he was thoroughly modest, thinking always of others rather than himself.

His predominating characteristics, however, were his unselfishness and his industry. Though his natural tastes were all those of a student, and his inclinations were towards a quiet life of repose, where his literary and scientific powers could have enjoyed full play, he resolutely laid everything aside in order to mingle with his fellow men, perform the duties which he felt belonged to him in the economy of life, and thus make the most he could, for the benefit of others, of the powers which had been given him. And he exemplified by his industry how much may be accomplished, in many different directions and spheres of activity, by a well-ordered life, not allowing the cares of business, of money-getting, or of ambition, to prevent him from doing his whole duty to his family, to his friends, to his fellow citizens, and, so far as lay within his powers, to the enlightenment and uplifting of the human race.

## OUR LOCAL GEOLOGY

BY W. H. BARRIS

### INTRODUCTORY AND EXPLANATORY.

IN former papers on our Local Geology, the author treated of the discovery, character, and contents of the lowest series of fossiliferous rocks here exposed on the Mississippi River.

They had been necessarily overlooked in the earlier Geological surveys of the State, inasmuch as they had not been discovered until after those surveys were completed. Lithologically they seemed distinct from any of the rocks with which they were here associated. Their more characteristic fossils were new and undescribed, differing widely from any of the forms above them. It was acknowledged they underlaid what was considered the western extension of the Hamilton Group of the New York geologists. From these they seemed widely separated. There was a difference in rock structure apparent at a glance. Fossils were new, some having an external resemblance to those of the Corniferous. The appearance of certain corals and the presence of a coral-reef suggested such reference.

It was not simply an individual caprice or fancy that led to such identification. The highest authorities in both Iowa and Illinois geology had plainly and fully expressed their opinions. Professor Hall had traced the rocks of the Upper Helderberg through and below the city, had defined their position in Rock Island as underlying the Hamilton.\* Professor Worthen considered them to be most nearly allied to the Hamilton of New York, and yet claimed they contained some fossils that in that State were characteristic of the Upper Helderberg. Hence, his conclusion was that they were really the western representatives of *both* these formations.† In view of such facts, and in deference to such authority, the local workers in the rocks naturally came to the conclusion that both the Upper Helderberg and Hamilton were here represented. That such conclusion was not altogether satisfactory is made evident by the fact that in neither of the three col-

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\* Geology of Iowa, Vol. I., page 86.

† Geology of Illinois, Vol. I., page 120.

lections here made—that of the College, the Academy, or my own—were any of the fossils labelled "Corniferous" or "Upper Helderberg."

In the present paper, attention is directed not as heretofore to the study of a single fossiliferous rock, but extended to the whole series of which it here forms a part. This series admits of three natural divisions.

These were first recognized and published by Professor Calvin. To the upper member, as developed at Buffalo and vicinity,\* he gave the name of *Spirifer Parryanus* beds, in view of the presence of that spirifer; to the next lower the name *Spirifer Pennatus* beds, that being its characteristic fossil. To the lowest the writer suggested the name of *Phragmoceras* beds—the *Phragmoceras walshi* being its most marked fossil in this vicinity. The Professor favored its application *simply* as a convenient local name. The name of each bed thus suggests its distinguishing fossil.

It is proposed to invite attention to each of these beds in the order of its exposure, to mark out something of its extent, its character and contents, as exhibited in the various localities on the river, to show the relations these beds sustain each to the other, and the *true significance* of such relationship.

#### THE PHRAGMOCERAS BEDS.

These comprise the lowest fossil-bearing rocks found in this vicinity. They extend from a point in the eastern portion of the city, and are seen on both sides of the river as far west as the Cook quarries. They also appear on Rock River, near Camden, Illinois.

The earliest indication of their existence is furnished by the discovery of the trilobite known as the *Proetus Prouti* of Shumard.† In his description of it, he writes: "I am indebted to the kindness of my friend, Dr. H. A. Prout of this city, who found it some years ago a short distance *above the town of Davenport, Iowa*, near the water level of the Mississippi, in 'compact grey limestone' supposed to be of the age of the Hamilton Group of the New York series." This *compact grey limestone* of which he writes is one of the persistent elements of the *Phragmoceras* beds. While every vestige of the rock *in place* has disappeared, the original specimen on which Shumard based his description was lost in the great fire at St. Louis, which swept away his whole collection. Fortunately a second and third specimen

\* *Natural History Bulletin of the Laboratories of the State University of Iowa*, Vol. I., page 26.

† *Transactions of the Academy of Science of St. Louis*, Vol. II., No. 1, page 111.

was found in Cook's quarry just below the city, and which at his request was loaned to Professor Hall, who redescribed the species, illustrating both specimens in his great work on Palaeontology.\*

The next exposure westward was long known as the LeClaire quarry, located within the city limits, but now entirely obliterated. For years it had been visited, and collections made mainly from the Spirifer Pennatus beds. The quarry had the appearance of being opened for the sake of procuring stone suitable for building purposes. Excavation had gone down into the Phragmoceras beds, when the next succeeding limestones and shales must have become loosened, and resulted in a confusion and commingling of rocks and fossils of both beds. Here, as elsewhere, the Phragmoceras beds included their two most marked divisions. The upper consisted of a series of thin, hard, non-continuous layers of limestone. On the surface of many of these were crowded the detached valves of Owen's *Atrypa comis* (the *Gyptidula occidentalis* of Hall), and corresponding so closely to Owen's figure, particularly in the absence of frontal plications, that on mentioning the circumstance to Dr. Parry he responded that he had accompanied Dr. Owen to this very locality. Beneath these thin slabs could be traced the other member stretching for eight or ten feet down the bluff, a light grey, thick, heavy-bedded rock, in the roughened face of which stood out the weathered forms of some of its most ordinary fossils.

As a third locality, we have the extension of these beds across the river into Rock Island. One difference between this and other exposures was that the series of upper thin layers was to some extent absent. The upper member of the Phragmoceras beds graduated so gently into the lower part of the Spirifer Pennatus beds as scarcely to be recognized. Yet Professor Worthen did not fail at once to detect the difference.

In his description of the Devonian limestone between Rock Island and Moline, he separated it on purely lithological grounds into three divisions. The upper two correspond to Professor Calvin's Spirifer Pennatus beds. The lower is the Phragmoceras, and cannot be better described than in his own words: "These shaly limestones are underlaid by a fine-grained grey or dove-colored limestone, the upper part becoming tolerably massive." †

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\* *Natural History of New York. Palaeontology*, Vol. VII., page 126, Plate xxiii., figures 16-18.

† *Geology of Illinois*, Vol. I., page 121; Vol. V., page 223.

In a succeeding volume he speaks of its "being destitute of fossils except in the upper layers, near its junction with the shales."

These "upper layers," in virtue of their position and character, constitute the upper member of the *Phragmoceras* beds as they are elsewhere exhibited. The Professor further claims that there were no fossils in these beds, differing from those in the beds above them (the *Spirifer Pennatus* beds). He overlooked the fact that in the very volume in which the statement is made he had described one of its most characteristic fossils, the *Spirifer subundiferus*. In the next volume two others equally characteristic, the *Phragmoceras walshi* and *Calceocrinus barrisi*, were described and figured. Recrossing the river, in Cook's quarries, just below the city, on the bottom-land, and but a short distance from the river and little above its level, was the typical realization of the *Phragmoceras* beds.\* As originally described, the southern portion had been first worked, presenting for years the two marked divisions by which they were distinguished. The lower, answering to Professor Worthen's description, was a fine-grained, grey or dove-colored limestone, attaining a thickness of eight or ten feet, arranged in regular layers of a foot or more in thickness. Irregularly disseminated through the mass was found the greater part of the larger and best-preserved fossils. Conspicuous among them were the Cephalopods, Brachiopods, and Crinoidea. Above these were thin, non-continuous layers from two to three inches thick, extending upwards two or three feet, with abundant coralline forms, embracing *Cyathophyllum*, *Favosites*, *Cladopora*, *Alveolites*, and *Stromatopora*. On the surface of the ground the same forms occurred in abundance, while in a neighboring quarry they were massed together in a reef. As the quarries were worked northward these layers became gradually thickened, till they assumed something of the character of the rock on which they rested, carrying few fossils. Occupying their place was a stratum of one to two feet in thickness, roughened with the broken valves of a shell, in external form closely resembling a *Rensselæria*, the greater number partially weathered, and so compacted together that while they existed in large numbers it was difficult to extricate a single individual from the mass without such breakage as to place it beyond all hope of positive identification. This today forms an extended layer capping the limestone beneath, and stretching on a quarter of a mile or more towards the bluff, excluding through the whole distance almost every other form of fossil.

\* PROCEEDINGS OF THE DAVENPORT ACADEMY OF NATURAL SCIENCES, Vol. II., page 261.

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[September 17, 1897.]

The following lists have been carefully prepared to meet the wants of those interested in the subject. All the fossils enumerated with scarce an exception were gathered from this locality. With the filling up of the quarries first worked and the gradual change in the rock northward, with corresponding decrease of fossils, it is not very probable that many of the rarer forms in the first list will again be met with. Yet it is possible that on further examination some of these may be found to have passed up into the *Spirifer Pennatus* beds, and in such case should be inserted in the second list.

1.—List of fossils characteristic of the *Phragmoceras* beds:

<i>Aulopora conferta</i> . . . . .	Winchell.
<i>Heliophyllum coalitum</i> . . . . .	Rominger.
<i>Alveolites minimus</i> . . . . .	Davis.
<i>Cystiphyllum conifolius</i> . . . . .	Hall.
<i>Pachypora fischeri</i> . . . . .	Billings.
<i>Gypidula comis</i> . . . . .	Hall.
<i>Pentamarella micula</i> . . . . .	Hall.
<i>Pentamarella arata</i> . . . . .	Hall.
<i>Productella spinulicosta</i> . . . . .	Hall.
<i>Spirifer subundiferus</i> . . . . .	Meek & Worthen.
<i>Rhynconella intermedia</i> . . . . .	Barris.
<i>Newberria johannis</i> . . . . .	Hall.
<i>Strophodontia concava</i> . . . . .	Hall.
<i>Megistocrinus nodosus</i> . . . . .	Barris.
<i>Stereocrinus triangulatus</i> . . . . .	Barris.
<i>Calceocrinus barrisi</i> . . . . .	Worthen.
<i>Straparollus lativolvis</i> . . . . .	Calvin.
<i>Gyroceras pratti</i> . . . . .	Barris.
<i>Phragmoceras walshi</i> . . . . .	Meek & Worthen.
<i>Actinopteria decussata</i> . . . . .	Hall.
<i>Conocardium cuneus</i> . . . . .	Conrad.
<i>Paracyclas elliptica</i> . . . . .	Hall.
<i>Paracyclas lirata</i> . . . . .	Conrad.
<i>Proetus prouti</i> . . . . .	Shumard.

2.—Fossils passing from the *Phragmoceras* into the *Spirifer Pennatus* beds:

<i>Astrospongia hamiltonensis</i> . . . . .	Meek & Worthen.
<i>Acerularia davidsoni</i> . . . . .	Hall.
<i>Crepidophyllum archiachi</i> . . . . .	Billings.

<i>Alveolites goldfussi</i> . . . . .	Billings.
<i>Spirifer fimbriatus</i> . . . . .	Conrad.
<i>Atrypa reticularis</i> . . . . .	Linnæus.
<i>Platyostoma lineata</i> . . . . .	Conrad.
<i>Phacops rana</i> . . . . .	Green.

## 3.—Undetermined fossils:

*Heliophyllum*, *Alveolites*, *Cladopora*, with *Bellerophon*, *Euomphalus*, and *Gomphoceras*.

One other locality is worthy of a passing notice. Professor Worthen claimed that the whole floor of Rock River, from Camden almost to the Mississippi, is composed of this rock.\* He writes: "The massive solidity, conchoidal fracture and white dove-color of the stone indicate it belongs to the lower portion of the formation." Few fossils were found in it when he wrote. Subsequently, when the river was drained, many of the rarer forms were found.

A few rods from the bridge, in the rise towards the bluff, are the remains of an old quarry in which the upper thinner layers are more than usually thickened and carrying some of the usual fossils in excellent condition.

It is only in the Phragmoceras beds, and confined to their lower portion, that Ganoidal remains have been found. Fragments of plates occur measuring nearly an inch in thickness and several inches in length and breadth. As in other localities, their entire surface is covered with small stellate tubercles. Apparently similar fragments appear among fossils of the Hamilton formation of Ontario, Canada, in their best known localities. These fragments have been formally acknowledged by Whiteaves, in the Geological and Natural History Survey of Canada, as parts of the cranial plates of the *Macropetalichthys Sullivanti* Newberry,† at first described from the Corniferous of Ohio.

## SPIRIFER PENNATUS BEDS.

Between these beds and those just described a marked contrast exists extending to rock and contents. There are soft clays, irregularly bedded, light-colored limestones, often separated by bands of calcareous shale, and, in addition, holding a prominent place and maintaining a definite position in these beds, is a persistent encrinal limestone.

\* *Geology of Illinois*, Vol. V., page 227.

† *Contributions to Canadian Palæontology*. Vol. I., Part II., Sec. 2, page 119.

*Geological Survey of Ohio. Palæontology*. Vol. I., page 290.

Fossils assume a greater variety of forms. There is an increase both in the number of species, as well as multiplicity of individuals.

Adopting the same order as before, we may revisit the LeClaire quarry. Though limited in extent, the lithological and faunal differences are at once recognized. The soft clay enclosed a profusion of small fossils. With the minute, frail, delicate bryozoa were mingled brachiopods equally small and delicate. The limestone carried the common forms. Of the two American species of *Hexacrinus*, one was found in the encrinial limestone of this quarry. The Academy was fortunate in having it studied, described and figured by Messrs. Wachsmuth and Springer, who gave it the name of *Hexacrinus occidentalis*.\*

Of these beds, as exposed in Rock Island, no later or better summary can be given than that by Prof. Udden.† The section described was near the Rock Island depot, and divided into three parts: "The upper twenty feet was composed of shaly limestone and calcareous shale, containing throughout fossil brachiopods and, near the top, stems of various crinoids. The next six feet comprised three ledges of limestone separated by seams of shale, and containing about the same fossils as the beds above. The lower consisted of three solid ledges of a strong limestone, seven feet thick, containing a less number of brachiopods and more corals." The two upper portions represent the *Spirifer Pennatus* beds, the lower, the *Phragmoceras*.

From this bluff exposure at Rock Island, crossing the river, we descend to the low bottom land below the city in which Cook's and neighboring quarries were wrought. The entire mass of the *Spirifer Pennatus* beds has almost disappeared. The bluff from which they were detached is more than a mile to the northward. The surface rock through that whole distance is the *Newberria* strata of the *Phragmoceras* beds, and only in its slight irregularities and shallow troughs are traces of the shale to be found. At the quarries the limestones and shales represented at Rock Island by over thirty feet of thickness have dwindled down to two or three feet, still carrying their larger fossils. Underneath is a soft clay like that in the LeClaire quarry, crowded with exquisitely-preserved small brachiopods and as equally delicate small bryozoans. There is no further exposure through a distance of five or six miles, where we reach the quarry of Mr. John Sauer. It is

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\* *North American Crinoidea*, by Wachsmuth and Springer, Vol. II., page 745, and *Atlas*, Plate lxxviii., fig. 10.

† *Report of the Illinois Board of World's Fair Commissioners at the World's Columbian Exposition*, page 136.

situated on the brow of the bluff facing the river, and shows the following section:

	FEET.
1. The uppermost member is a fine-grained limestone with few fossils, layers growing thinner towards the base. . . . .	5
2. Encrinial limestone resolvable into three layers, the upper part of each crowded with, the lower more sparing, of fossils. . . . .	6
3. Thin shaly limestone abounding in bryozoa and corals, brachiopods generally crushed and massed together, Orthis being the most prominent . . . . .	5

Beginning at this quarry and still going westward, within the next four miles is found, at comparatively short distances from each other, no less than six long ravines, each, in its course, contributing something to our knowledge of the rock. This whole ravine region deserves a slight notice. I have called them ravines. In reality they are valleys of erosion two or three hundred feet broad, thirty to fifty feet high, not the result of any forces now in existence. The little streams have simply hunted them up—taken advantage of their work to make the nearest way to the river, doing some excellent work as they passed along. Their apparent origin seems simple. Little rivulets originating back in the prairies running southward, swollen by rains and especially spring freshets, have cut their way through the soil and into the upper part of the shales, have ploughed deeper in their course as they approach the bluff, leaving on their banks for a mile or more masses of rock and shale. The excavation goes on through the long slope stretching towards the river, building a channel for its course. The rock, whether exposed in the ravines, at the bluff, or on the long slopes extending to the river, with one exception, is always that of the *Spirifer Pennatus* beds. All the quarries that have been opened are in the same beds. Along the crown of the slope occur their most prominent features.

A few rods east of Mr. Sauer's quarry and along its side extends the First Ravine. Though shorter than some of its neighbors, it originates back in the prairie, and along its course for a long distance good exposures of rock and shale may be studied. North of the quarry for thirty or forty feet extend thick, heavy beds of encrinial limestone. They form a sharp contrast with the softer, thinner layers in the quarry,—showing the change occurring in the same rock within such short distance. Between this and the next ravine,

and at about the same height as the Sauer quarry, a new, large quarry has just been opened on the farm of Mr. J. G. Dutcher.

The section shown is as follows:

	FEET.
1. Irregular layers of shaly limestone slightly fossiliferous.	2
2. Layers still more irregular.	3
3. Thickened strata including three beds of encrinial limestone.	7
4. A slight bluish limestone <i>in this place</i> arranged in regular strata each of 6 or 8 inches, forming the floor of the quarry.	6

In all other places this limestone is most irregularly bedded. It is readily recognized, abounding in broken fragments of fossils which are of a darker blue than the rock in which they were imbedded.

One-quarter of a mile west of this quarry, and nearly half a mile from the First Ravine, we find the Second. In many respects it differs from the first. It cuts through the limestone at a lower horizon. It shows not a continuous, regular exposure, but abounds in occasional bluffs attaining a height of fifteen to thirty feet. These challenge attention not only for number or height, but for irregularity in bedding. Strata are laid down sometimes horizontally, but oftener diverging from such rule, often disposed in long, flexuous curves, each bearing only the slightest possible resemblance to its neighbor. To a student interested in abnormally developed strata this locality commends itself.

To add to the perplexity, the same strata change in thickness with every new exposure. Leaving out this element of uncertainty, the section is as follows:

1. First and uppermost is a well-defined *coral reef* showing a thickness of one or two feet.
2. The upper series of limestones and shales especially noted for disturbances in bedding.
3. Encrinial limestone in the mass or distributed in layers.
4. A hard, often softer, calcareous shale filled with brachiopods, *Orthis* being the prevailing form.
5. Second series of limestones and shales firmer at the bottom of the dry channel.

May it not be owing to the changing, almost abnormal, condition of the strata characterized as No. 2,—that while every step is made over broken fragments of fossils, scarce a perfect form is found?

A quarter of a mile west, on the farm of Mr. William Sauer, is a quarry in the Third Ravine.

Prof. Hall\* recognized the shales and shaly limestone underlying the encrinial limestone, giving a section of fifty or sixty feet as follows:

Encrinial limestone, . . . . .	10—15 feet.
Shales and shaly limestone, . . . . .	50 feet.

Since his visit, resting on the encrinial limestone, a quarry has been opened in the *upper* limestones and shales showing a further height of ten feet. Another addition is effected through the change wrought in the encrinial limestone. As it *here* appears it is a single huge, solid block thirty feet in length and ten to twelve in height, apparently capable of resisting all ordinary elements of change or decay. Yet as we ascend the ravine we find that for nearly a mile the beds and banks of the little stream are strewn with thin layers of the limestone from an inch to two inches in thickness, their surfaces covered with cri-noidal columns and occasional well-preserved smaller corals and bryozoa. The fall in the stream for a mile should be taken into account, as it adds further to the height of the rock. The exposure suggests the changing horizons of the three ravines so far noticed. The First cuts into the extreme upper part of the upper limestones and shales. The Second ploughs still deeper into the central portions. The Third finds its way into and through the encrinial limestone. Two peculiar exposures of the upper limestones should not be overlooked. They occur a quarter of a mile west, just above where the little stream running through the *Spirifer Parryanus* bed crosses the bluff. In its bed, and covering the entire width of the stream for a short distance, is a rock roughened with the remains of large *Orthocera* and *Gomphocera*. One of the latter was found in excellent condition. This rock may be the extension of the coral reef referred to before, and best exhibited in the Fourth and Sixth Ravines. One thing is certain: a *Gomphoceras* of similar size, and in the same relative position, is found in both ravines. A short distance above this rock is found a mass of soft clay abounding in perfect forms of a large *Orthis*, large and small *Stropheodonta demissa*, and, in a higher portion, abundance of *Blothrophyllosum*. It is most probably the only exposure above the encrinial limestone where large brachiopods have been found.

The Fourth Ravine is about one mile east of Buffalo. Prof. Hall found there the same series of beds described in the Third Ravine, with the encrinial limestone at the upper part, having a thickness of fifteen or twenty feet. The knowledge since obtained, and the appar-

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\* *Geology of Iowa*, Vol. I., page 86.

ent confused succession of some of the beds, will justify a passing notice. At the mouth of the creek the thicker beds of the lower limestone and shale, in disturbed condition, extend into the river, appearing in the ravine as scattered huge blocks for some distance, and then taking the form of an extended level bottom-rock, over which the stream flows. On the east side, in the bank, appears the encrinial limestone, gradually thickening and rising as we ascend, until, from beneath, there crops out a long exposure of the shale crowded with broken valves of *Orthis* and other brachiopods. Opposite, and across the stream, has been opened in the upper limestone and shales a large quarry. Beyond this, over the whole width of the stream — covering several yards — a stratum made up of *Spirifer Parryanus* rests partially on the encrinial limestone, and another and higher stratum on the coral reef. There is here no doubt of its position or contents. The *Acerularia davidseni* is prominent and the roughened calices of *Cystiphyllum americanum* lay almost parallel side by side.

The section here is as follows :

	FEET.
1. Coral reef, . . . . .	$\frac{1}{2}$
2. Upper limestones and shales. , . . . .	10
3. Encrinial limestone. . . . .	12
4. The <i>Orthis</i> beds. . . . .	6
5. Thick lower limestones and shales. . . . .	8

East of the mouth of the stream, on the river bank facing it, is an unusually interesting exposure extending half a mile. 3 and 4 of the above section is well exposed.

The Fifth Ravine, through which Cedar Creek flows, lies west of Buffalo, in the edge of the village, the quarry of Captain Clarke being its most noticeable feature. We call attention to some of its peculiarities: In approaching it from the river, the lower limestones are firmer than elsewhere, even the shales sharing in the same characteristic. When they carry fossils it is difficult to detach them from the matrix. The upper limestones at the falls are extremely heavy bedded and firm. In this quarry have been found the greater part of the Crinoidea and Blastoidea of the *Spirifer Pennatus* beds. Prof. Ulrich gathered here most of the bryozoa described and figured in the Eighth Volume of the Illinois Geological Survey. Above the falls, in the edge of the village, appears a rock differing from any other member of the series, cropping out on the banks of the stream for half a mile. It is in regular beds of four to six inches and attaining a thickness of

three or four feet. Its buff color suggests the Parryanus beds, but among the few thin, broken fragments of shells we scarce recognize any species from those beds. It abounds, however, in what seems to be the *Cystodictya hamiltonensis* of Ulrich; if not, a larger form of the same genus. Placing this rock, which is most probably local, at the head of the series, we have this section:

	FEET.
1. Buff limestone regularly bedded. . . . .	3
2. Upper limestones and shales, irregularly stratified on either side of the falls. . . . .	10
3. Crinoidal strata varying from two to six inches in thickness. . . . .	6
4. Orthis bed including here some other forms. . . . .	4
5. Crinoidal bed at base of quarry, in which most of the Crinoidea occur. . . . .	3
6. Lower limestone and shales extending in huge generally detached blocks to the river. . . . .	.

The levee in front of the village is made up of the lower members of the series. Taken together they present a greater thickness of horizontal strata than is found elsewhere. The best-preserved larger fossils of the Spirifer Pennatus beds have been found here.

The Sixth Ravine occurs one mile and a half below the village. Stevenson's Creek flows through the bottom-land to the river, and at its mouth the upper limestone appears as an extended, hard, solitary mass detached from its ordinary surroundings. One mile further north, directly under the Spirifer Parryanus beds, and accompanying them for some distance, with a thickness of little over two feet, is the coral reef. Its surface is covered with many roughened coralline forms. Prominent among these are the *Acervularia davidsoni* and *Cystiphyllum americanum*, as in the Fourth Ravine. With greater extent of the reef, they are in greater abundance. Half a mile further north is found an extension of the same strata, containing the same fossil forms, in a similar position at the base of the Spirifer Parryanus beds. The fossils of these beds are, for convenience of reference, arranged in three classes.

1.—The more common forms:

- Acervularia davidsoni* . . . . . Hall.
- Alveolites goldfussi* . . . . . Billings.
- Astraeospongia hamiltonensis* . . . . . Meek & Worthen.
- Atrypa aspera, var. occidentalis* . . . . Hall.
- Atrypa reticularis* . . . . . Linnæus.

<i>Aulopora serpens</i> . . . . .	Goldfuss.
<i>Chonetes scitula</i> . . . . .	Hall.
<i>Coenostroma pustuliferum</i> . . . . .	Winchell.
<i>Crania crenistria</i> . . . . .	Hall.
<i>Crania hamiltoniae</i> . . . . .	Hall.
<i>Cystiphyllum americanum</i> . . . . .	Edwards & Haime.
<i>Crepidophyllum archiachi</i> . . . . .	Billings.
<i>Cryptonella planirostra</i> . . . . .	Hall.
<i>Cyrtina hamiltonensis</i> . . . . .	Hall.
<i>Cyrtina triquetra</i> . . . . .	Hall.
<i>Favosites hamiltonensis</i> . . . . .	Rominger.
<i>Megistocrinus latus</i> . . . . .	Hall.
<i>Monticulipora monticula</i> . . . . .	White.
<i>Orthis iowensis</i> . . . . .	Hall.
<i>Phacops rana</i> . . . . .	Green.
<i>Platyceras ventricosum</i> . . . . .	Conrad.
<i>Platyostoma lineatum</i> . . . . .	Conrad.
<i>Productella spinulicosta</i> . . . . .	Hall.
<i>Productella subalata</i> . . . . .	Hall.
<i>Spirifer asper</i> . . . . .	Hall.
<i>Spirifer pennatus</i> . . . . .	Hall.
<i>Spirifer pereextensus</i> . . . . .	Meek & Worthen.
<i>Spirifer subattenuatus</i> . . . . .	Hall.
<i>Striatopora iowensis</i> . . . . .	Owen.
<i>Strophodonta demissa</i> . . . . .	Conrad.
<i>Strophodonta nacrea*</i> . . . . .	Hall.
<i>Strophodonta perplana†</i> . . . . .	Conrad.
<i>Strophodonta plicata</i> . . . . .	Hall.
<i>Strophomena chemungensis‡</i> . . . . .	Conrad.
Var. <i>arctostriata</i> . . . . .	Hall.
<i>Terebratula lineklaeni</i> . . . . .	Hall.

## 2.—A list of the rarer forms:

<i>Aulacophyllum sulcatum</i> . . . . .	Edwards & Haime.
<i>Ariculopecten princeps</i> . . . . .	Conrad.

\* *Photostrophia nacrea*. Eleventh Annual Report of N. Y. State Geologist, page 281, plate 14, figs. 11-13.

† *Leptostrphia perplana*. Eleventh Annual Report of New York State Geologist, page 281, plate 15, figs. 1-4.

‡ *Orthothetes chemungensis*. Eleventh Annual Report of New York State Geologist, page 284, plate 16, fig. 9.

*Orthothetes arctostriata*. Thirteenth Annual Report of N. Y. State Geologist, Vol. I., Geology, page 134, *et seq.*

<i>Bellerophon bowmani</i> .....	White.
<i>Botryllopora socialis</i> .....	Nicholson.
<i>Cystodictya hamiltonensis</i> .....	Ulrich.
<i>Dalmanites boothi, var. calliteles</i> ....	Green.
<i>Dalmanites (Cryphaeus) barrisi</i> .....	Hall.
<i>Dendropora proboscidialis</i> .....	Rominger.
<i>Elæacrinus elegans</i> .....	Hall.
<i>Elæacrinus meloniformis</i> .....	Barris.
<i>Elæacrinus obovatus</i> .....	Barris.
<i>Fenestrapora occidentalis</i> .....	Ulrich.
<i>Fistulipora collina</i> .....	Ulrich.
<i>Fistulipora monticulata</i> .....	Ulrich.
<i>Goniophora hamiltonensis</i> (?).....	Hall.
<i>Gyroceras constrictum</i> .....	Meek & Worthen.
<i>Heteroschisma gracilis</i> .....	Wachsmuth & Springer.
<i>Liopteria sayi</i> .....	Hall.
<i>Pholidops hamiltonensis</i> .....	Hall.
<i>Proetus occidens</i> .....	Hall.
<i>Spirifer inutilis</i> .....	Hall.
<i>Semicoscinium rhombicum</i> .....	Ulrich.
<i>Strombodes johannis</i> .....	Hall & Whitfield.
<i>Taxocrinus nuntius</i> .....	Hall.
<i>Taxocrinus gracilis</i> .....	Meek & Worthen.
<i>Terebratula iowensis</i> .....	Calvin.

3.—A list of fossils as yet undetermined:

Among these are found *Aviculopecten*, *Blothrophyllum*, *Calceocrinus*, *Crania*, *Cyrtoceras*, *Dentalium*, *Elæacrinus*, *Gyroceras*, *Gomphoceras*, *Loxonema*, *Mytilarca*, *Machrocheilus*, *Murchisonia*, *Orbiculoides*, *Orthoceras*, *Pleurotomaria*, *Tentaculites*, and *Spirorbis*.

While some of these are not in good condition, only in shape indicating the genus to which they belong, others are well preserved and warrant further study. The author had hoped to accompany the present paper with another containing “Palaeontological Notes and Descriptions of New Fossils.”

The lists given throughout this paper represent individuals found in this vicinity and now in one of the three collections before referred to.

THE SPIRIFER PARRYANUS BEDS.

These beds, when fully represented in this vicinity, are composed in their upper portion of layers of heavy-bedded light-colored non-

fossiliferous limestones. These are succeeded by shales and shaly limestone which, through their whole thickness, are made up of masses of fossils, mainly of the *Athyris vittata*. These are again followed by limestones resembling those in the upper portion, but more firm and carrying some of the usual fossils.

The contrast with the *Spirifer Pennatus* beds is very marked. There are no alternations of light-colored limestones and shales, encrinial limestones or coral reefs. These have disappeared. Another series succeeds, in many respects widely different. The general construction is heavy, massive. Thin layers of rock are not indulged in. The shale is like no other shale. It is in full sympathy with the surroundings. There is nothing light or cheery about it. The mode of deposition favors no such idea. And then comes in the color—drab, uniform, persistent to the very last.

There are no Corals, Crinoids, Gasteropods, Cephalopods, or Crustacea. Brachiopods alone survive, their number greatly diminished. Of these Prof. Calvin has furnished the following complete list:

<i>Spirifer parryanus</i> .....	Hall.
<i>Spirifer asper</i> .....	Hall.
<i>Athyris vittata</i> .....	Hall.
<i>Cyrtina umbonata</i> .....	Hall.
<i>Atrypa reticularis</i> .....	Linnæus.
<i>Terebratula</i> .....	Undescribed.
<i>Strophodonta</i> .....	Undescribed.

To these none have been added since his publication. No exposure of these beds occurs through the distance of seven or eight miles below the city. They are then found in the First Ravine, over half a mile north of the bluff. A small hillock stands in the very midst of the stream, made up of the buff limestones and accompanying shales, the latter filled with the usual smaller fossils. Within a short distance two or three other patches appear. Another equally limited exposure is seen in the Second Ravine, and about the same distance from the bluff. Fossils had been found in the bed of the stream from time to time, but no trace of their origin, until very lately. A little rivulet had found its way down from the top of the hill, hewing into the shales and limestones of the *Spirifer Pennatus* beds until a succession of steps of unequal thickness was formed extending down to the main stream. On mounting these, at the very summit appeared for the first time the

coral reef, and resting on it both the limestones and shales of the Spirifer Parryanus beds, almost lost under the soil of the prairie.

In the First Ravine the beds appeared in the bottom of the stream. In this, they were only reached by a lengthy, tortuous route, and found at the top of the hill from thirty to forty feet above the stream.

The Third Ravine contains no exposures, but following a road west of William Sauer's quarry nearly a quarter of a mile, a little stream is encountered crossing the bluff, in two particulars differing from any of the others we have noticed. It runs in an entirely different direction. They from north to south to the river, this from west to east, making a sharp angle to cross the bluff. It is the only stream whose whole course lies through the Spirifer Parryanus beds. For a quarter of a mile exposures are frequent both in rock and shale. First appear large, heavy, extended blocks detached from the bluff, usually sparing of fossils. As we ascend the shales come into view. The channels cut by the stream are unusually deep and crowded throughout the entire depth with masses of broken shells of, mainly, *Athyridus vittata*. Beyond these the hardened limestone is again seen till lost in the prairie. The following section is given:

	FEET.
Thick, heavy bedded limestone.	. . . . . 4
Shales, excessively fossiliferous.	. . . . . 5
Lower harder limestone.	. . . . . 3

In the Fourth Ravine, generally known as the "Dodge Ravine," is a remarkable exposure of these beds just north of the large quarry in the Spirifer Pennatus beds. The encrinial limestone here attained its utmost hardness and forms for some distance the smooth floor over which the stream flows. Its width is forty or fifty feet and across it had extended two or three strata of limestone a few inches in thickness, filled with the casts of Spirifer Parryanus. The action of the water had broken away all the central portions, leaving on both sides of the stream projecting towards it these differing strata. The crowded condition of the shells, their number, their exclusion of every other form, calls to mind the description given by Prof. Calvin of casts of the same Spirifer as found at Montpelier in a slightly differing rock.\* The locality has been worked by visitors who would naturally suppose it to have been in the Spirifer Pennatus beds. Certain peculiarities would favor such conclusion. The appearance of the Spirifer in such

\*Geology of Iowa, Vol. I., page 45.

numbers is unheralded by any *apparent* change in the rock. They are also unaccompanied by their usually associated fossils.

The hardened rock of the *Spirifer Parryanus* beds rests first upon the encrinial limestone, and when that disappears, on the coral reef. A short distance beyond this, and for the first time in the banks of the stream, are seen thick, heavy strata assuming very gradually something of the usual characteristics of the beds even as to color, the whole still very sparing of fossils. In the bed of the stream for a long distance, in the matter of form, color, and hardness, the limestone seems assimilated to the rock on which it rests. The upper member, heavy bedded, buff-colored, is seen in place half a mile distant, resting on the hardened layers of the shales, which, though crowded with the smaller fossils, yet refuses to release them from their matrix, owing to the extreme hardness of the material in which they were embedded.

In the Fifth Ravine, where Captain Clarke's quarry is located, is a comparatively limited exposure occurring on the east side of the Falls. Huge blocks have been detached from their place in the bluffs, falling down and standing on edge. Some of these measure several feet across and are two or three feet thick, showing the usual smaller fossils. The lower portion extends in a perpendicular face to the quarry in the lower beds. Above these Falls are a few scattered rocks, but there is no further extension of the rock northward.

The Sixth Ravine, one mile and a half below Buffalo in the banks of the stream and one mile above its mouth, presents an interesting exposure. The *Spirifer Parryanus* beds assumes something of its typical form. The upper portion is buff-colored and heavy bedded, almost non-fossiliferous, with a height of five feet. The middle portion is composed of the softer clays and shales filled with the ordinary fossils, and is about five feet in thickness. The lower part maintains its ordinary features for two or three feet till it approaches the stream, when, in direct contact with the underlying rock, it gradually becomes firmer and finally assumes the color and hardness of the coral reef. Just as in the Fourth Ravine, a similar change was wrought in the lower portion of the *Spirifer Parryanus* beds in contact with the encrinial limestone. One-half mile further north, on the east side of the stream, the shales and shaly limestones are again seen prolific in fossils, while the lower portions rest on the coral reef conforming to its color and hardness.

#### SUMMARY AND CONCLUSION.

The *Phragmoceras* beds first recognized in the eastern part of the

city are exposed on both sides of the river, culminating in thickness and interest in the Cook and neighboring quarries, and disappearing a short distance below. They are of comparatively limited extent, confined within two or three miles and reaching a height of about twelve feet. They contain characteristic fossils to the number of twenty-four. Eight pass into the beds above, while about the same number are undetermined.

The *Spirifer Pennatus* beds appearing in the old LeClaire quarry are seen on both sides of the river and are in full force throughout the Ravine region, disappearing for a time with the exposure in the Sixth Ravine. Of greater extent than either of the other beds, they appear through the distance of eleven or twelve miles and in height range from sixty to seventy feet. About sixty species of fossils have been found in these beds, while but one of them is represented in the succeeding beds and eighteen are undetermined.

The *Spirifer Parryanus* beds are not found through the distance of seven or eight miles below the city, and then only in patches in the First and Second Ravines. They are well exposed on the little stream between the Third and Fourth Ravines, carrying all their peculiar characteristics into the Sixth Ravine, beyond which they soon disappear. Their extent is about four miles, their height from twelve to fifteen feet. Described fossils are limited to five, while two are undetermined.

As to the place of these beds in the Geological formations of the state, it will be remembered that the Devonian of the State of New York embraced four large Geological formations. It was natural to suppose that in its extension westward some of these formations would again appear. As early as the Second Geological Survey, Prof. White took the ground that all the Devonian strata of Iowa evidently belonged to a single epoch, undoubtedly referable to the Hamilton period, as recognized by the New York geologists.\* After long, patient study, Prof. Calvin came to the same conclusion. As one of the results of his labors he separated all the calcareous beds of the Iowa Devonian into three divisions. The first he named the Lime Creek Shales, the second the Cedar Valley Limestone, the third the Independence Shales.

It is to the middle division, "the great limestone series," that the beds described in this paper belong. The writer has directed attention simply to a study of its most easterly outcrops, trusting his work may be of some use to the student in his geological studies.

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\* *Geology of Iowa*, White, Vol. I., page 187.

The subject thus presented suggests the fault of former papers on "Our Local Geology," in referring the lower beds to the Corniferous limestone. It consisted in emphasizing certain conditions as peculiar to the *Phragmoceras* beds, when, as we have shown by comparison of bed with bed, it is found that conditions equally characteristic distinguished the other two. Unity is thus reached, not diversity. The very differentiation of these beds as to lithologic and palæontologic character, instead of separating, binds them together as parts of one Geological formation. In keeping with such relationship is the fact that one-third of the fossils of the *Phragmoceras* beds pass up into the *Spirifer Pennatus* beds, suggesting another bond of union. In the list given how few fossils can be recognized as positively characteristic of the Corniferous limestone.

Further, and establishing the true relationship of these beds to each other, is the significant fact that there are no signs of disturbance between the *Phragmoceras* and the *Spirifer Pennatus* beds that would suggest a separation. Despite a single apparent exception, and that at the summit of the *Spirifer Pennatus* beds, the same continuity of rock deposition is maintained throughout the whole series.

Efforts have been made from time to time to correlate the whole or parts of the Iowa Devonian limestone with the whole or parts of the New York Devonian, but have not proved entirely satisfactory. The incorporation of the following remarks of McGee into the first volume of the Iowa Geological Survey by Prof. Keyes, then Assistant State Geologist, no doubt voices the opinion of the Chief of the Survey, and its reproduction here may well close the present paper.\*

"It is therefore manifestly unwise to correlate either the limestones alone or the entire series of Devonian strata with any of the New York divisions; and while the shales may be discriminated on both lithologic and palæontologic grounds, it is not now possible (and perhaps it never will be possible) to separate the limestone series into distinct formations or into individualized beds of more than local value. They may accordingly be treated as a unit and may take an individual name; and it seems expedient to recur to the designation originally proposed by Owen, and rechristen the entire series of Calcareous sediments stretching from the Minnesota line to Muscatine County in a belt fifty miles in average width, the *Cedar Valley Limestone*."

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\* U. S. Geol. Surv., 11th An. Rept., page 319.  
Iowa Geol. Surv., Vol. I., page 39.

## A STUDY OF A CENSUS OF THE PUEBLO OF COCHITI, NEW MEXICO.

BY FREDERICK STARR.

FOR some time it has seemed to the writer that the quickest and simplest method of getting at the fundamental facts in the social organization of any one of our Indian tribes would be the taking of a census of the whole population by houses, securing the clan of each person and his relationship to the other members in the household. In making general inquiry of Indians regarding clans or the structure of society some details are almost sure to be missed; with such a census, properly made, no point can finally be overlooked. It has been believed, also, that such a census would be useful material to place in the hands of a class of students for study. Impelled by these two ideas, we made a house census of the Pueblo of Cochiti, N. M., on our last visit there in September.

The structure considered typical of most American tribes may be briefly stated. Two ideas are fundamental—the importance of blood kinship and the supremacy of woman in the household. The tribe is made up of a certain number of clans, gentes, or kins, whose members are blood relatives and bear the clan name; relationships are traced through the woman, and children belong to the clan of the mother; the father is of another clan, as marriage between members of one clan is prohibited.

In 1890 Bandelier\* stated that at Cochiti there were "at least thirteen clans," the names of which he gave as follows: Sun, water, cottonwood, turquoise, panther, bear, calabash, mexican sage, coyote, corn, scrub-oak, fire, ivy. It is plain that Bandelier cannot have made a detailed census, such as is above suggested. This will appear presently.

The census of Cochiti on September 28, 1897, follows:

NO.	NAME: SPANISH.	NAME: INDIAN.	CLAN.	REMARKS.
1.	Santiago Quintana.....	Pā-wi-tē.....	Tanyi.	
2.	*Sefarina Garcia. f.....	Shrā-ki-mi .....	Hapani.	
3.	Estafana Quintana. f.....	Shwi-ti-ütz.....	Hapani.	
4.	Maria Vittoria Quintana. f.	Tsā-mü-i-ütz....	Hapani..	"Tassel of Corn."

\* *Papers Archaeological Institute of America, American Series, Vol. III., p. 273.*

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NO.	NAME: SPANISH.	NAME: INDIAN.	CLAN.	REMARKS.
5.	Pablito Quintana.....	Wā-pō-ñī .....	Hapani...	"Sea Shell."
6.	José Domingo Quintana...	Shrā-kū.....	Hapani...	"Out of the North."
7.	M. Cresenciana Quintana.f.			Hapani.
8.	M. Cecilia Quintana. f.....	Sti-ér-ú-paí-mū	Hapani...	"The entire field."
9.	Francisco Quintana.....	Hau-wi-yi-nū.	Tzitz.....	"Cornstalk."
				Husband of No. 3.
10.	Demasio Quintana .....	Kō-rai-ti-wā ..	Hapani...	Son of 9 and 3.
11.	José Samuel Quintana. ....	Ó-mā-ti-wā ..	Hapani...	Son of 9 and 3.
12.	Santiago Quintana.....	Ā-rā-hō-mā ..	Hapani...	Son of 9 and 3.
13.	Juanito Chavez .....	Hitz-ti-wā .....	Hitraani...	"Blue Jay."
				Husband of No. 4.
14.	Maria Graviolita Chavez f.			Hapani... Daughter of 13 and 4.
15.	José Domingo Chavez....	Hi-ōrsh-kō-mū.	Tzutsuna..	"Corncob."
				ti-wa.
16.	*Juanita Semilla. f .....	Hi-ärst-ütz....	Huashpa..	"Dawn."
17.	M. Cension Chavez. f.....	Yā-tsi-ri.....	Huashpa.	
18.	M. Anna Chavez. f .....	Hā-wē-rin-ütz.	Huashpa..	"Plants."
19.	Juan de Jesus Patagordo...	Yē-mā .....	Oshatch.	
20.	Juan Ysidro Chavez.....	Shrā-yō-ti-wā..	Isi.	
21.	*M. Laurencita Romero. f.	Shrā-rā-ti-yā-ñī	Hitraani.	
22.	José Maria Quintana.....	Hā-kā-yā-ti-wā	Shoame...	A yellow bird.
23.	*Dominga Herrera. f.....	Hi-wütz.....	Isi.	
24.	M. Trinidad Melchoir. f...	Shrā-ni-yā .....	Hitraani..	Wid. of son of No. 22.
25.	Dominga Quintana. f.....	Shrit-yai-yā .....	Hitraani..	Daughter of No. 24.
26.	Andrea Quintana. f. ....			Hitraani.. Daughter of No. 24.
27.	Santiago Cordero.....	Kai-wi-ä-ti-wā.	Tanyi.	
28.	*Juana M. Matalova. f....	Kā-yi-ya-ñā...	Shipewe.	
29.	Ventura Cordero.....	Pai-i-nā.....	Shoame...	Son of 27 by former wife
30.	Manuel Cordero .....	Ai-rō-ti-wā....	Shoame...	Son of 27 by former wife
31.	Anastasio Cordero.....	Mō-shätsh....	Isi. ....	"Buffalo."
				who is a widower.
32.	Manuel Melchoir.....	Shra-wē-dē..	Shoame.	
33.	*Candelaria Arcera. f....	K'ā-wi-ti-ā....	Hitraani.	
34.	Santiago Quintana.....	Kā-ō-ti-wā....	Hitraani..	Son 33 by former hus'd.
35.	Pifanio Melchoir.....	Ke-chā-wū....	Hitraani..	"To go running."
				of 32 and 33.
36.	Madelina Suina. f.....	É-ha-ri-tzū....	Tanyi ....	Wife of 34.
37.		f.		Tanyi .... Daughter of 34 and 36.

NO.	NAME: SPANISH.	NAME: INDIAN.	CLAN.	REMARKS.
38.	Santiago Quintana			Isi..... Adopted son of 34.
39.	José Maria Chee	Dai-kū-ně	.....	Hitraani.
40.	*Manuela Mokina. f.	A-tě-mi	.....	Huashpa.. She has many children: some live outside. Now with fourth husband.
41.	Juanito Trujillo	Ki-yā-rai-č-ti-wa.	.....	Huashpa.
42.	Taniclauo Trujillo	Tsā-ti-yū	.....	Huashpa.. “Out in the hills.”
43.	Rosendo Trujillo	Shrau-ti-č-ti-wā.	.....	Huashpa.. “Sprouting.”
44.	Antonio Melchoir	Shrō-yai-yot-nī.	Shoame..	
45.	*Rita Venadita. f.	Sō-rō-pa	.....	Hitraani.
46.	Guadalupe Romero	Shō-wai-ä-ti-wā.	Oshatch..	Cacique of the village.
47.	*M. Matiana Akaka. f.	Tsi-ō-tě	.....	Hitraani.
48.	Adelaido Montoya.			Hitraani.. Son-in-law of No. 46.
49.	*Losijita Romero. f.	Tsē-ti-mě	.....	Hitraani.. Daughter of 46 and 47.
50.	José Francisco Montoya	Hi-ä-č-ti-wā	.....	Hitraani.. Son of sister of 48. The mother lives, but presented boy to her brother.
51.		f...		Hitraani.. Daughter of 48 and 49.
52.	M. San Juana Quintana. f.	Shi-wi-ä-ña	.....	Isi..... Widow.
53.	Marcial Quintana	Kō-tsā	.....	Isi..... Name of a hawk species. Son of 52.
54.	Nepomoseno Quintana	Wā-kā-nē	.....	Isi..... “Rush” or “Cane.” Son of 52.
55.	Francisco Quintana	Kā-rū	.....	Isi..... “The rose of Castile.” Son of 52.
56.	Cipriano Quintana	Ō-shā-ti-wā	.....	Isi..... “Sun.”
57.	*Maria Rosaria Arcera. f.	Shrai-wi-ūtz	.....	Shipewe.
58.	Juan de Jesus Pancho	Hai-ō-wē	.....	Hitraani.. Married outside of tribe.
59.	Tonio Suina	Tsir-ti-ä-ti-wā	Tsutsuna.	
60.	*	f.....	Pō-rā-kā	..... Hapani... “Dove.”
61.	Juanito Suina	Kā-ō-mā-ti-wā	?	Son 59 and former wife.
62.		f.....	Hapani	... Daughter of 59 and 60.
63.		f.....	Hapani	... Daughter of 59 and 60.
64.	Ventura Lucero	Kā-tzō-mā	....	Shipewe .. “When men begin life.”
65.	*Candelaria Urbana. f.	K'ě-nā-tē-dzū	Tzutsuna.	
66.		f.....	Tzutsuna.	.. Daughter of 64 and 65.
67.	Chavez Trujillo	Tsi-wi-ti-wā	...	Oshatch..
68.	*Margarita Chavez Pancho. f.	Ki-yai-ti-ä-nū	..	Huashpa.
69.	Florenzio Trujillo	Ki-ti-wā	....	Tzutsuna.. Son of 67 by former wife.
70.	Juan José Trujillo	Ā-sō-nā	....	Tzutsuna.. “Swelling maize.”

NO.	NAME: SPANISH.	NAME: INDIAN.	CLAN.	REMARKS.
71.	Carolina Trujillo. f.....	Ai-ō-ūtz.....	Tzutsuna..	Daughter of 67 by former wife.
72.	Mariano Chavez.....		Isi.	
73.	*Lopita Archevequef....	Kwi-nū-tě .....	Isi.	
74.	Francisco Chavez.....	Shi-kět .....	Isi.	"Star."
75.		Pō-rai-ti-wā...	Isi.	
76.	Tobias Chavez.....	Wā-ti-wā.....	Isi.	
77.		f. ?...Hō-ō-kā.....	Isi.	
78.	Manuel Nambe.....	Kai-kē-ě-ti-wā.	Huashpa.	
79.	*Teresita Moradas. f.....	Ā-hwā-nū-tzū..	Hitraani.	
80.		Shau-wā-kě-rē.	Hitraani.	
81.		f.....		Hitraani.
82.	Salvador Montoya.....	Tsēr-tshrō-yā..	Shipewe .	
83.	*Lorenzita Chee. f.....	Tshrā-wā-těa..	Isi.	
84.	Santiago Montoya.....	Tsā-yā .....	Isi.	
85.	Vittoria Montoya. f.....	Tshrau-i-tě-rā- tzū	Isi.	
86.		Kā-nū-rū .....	Isi.....	Name of a bird.
87.	M. Velina Montoya. f....	Kau-yō-tě.....	Isi.	
88.	Victoriano Herrera.....	Rō-ti-ā-nā .....	Isi.	
89.	*M. Ignacia Archeveque. f.	Ki-ātz-imě .....	Isi.	
90.	Torivio Herrera.....	Wai-těr-ā-ña ..	Isi.	
91.	Lorenzo Herrera.....	Tsě-ki-ūt-yě..	Isi.	
92.	M. Miguela Herrera. f...	Kā-tsi-ā .....	Isi.	
93.		Tsi-ri-ā-ti-wā..	Isi.	
94.	Juan Cordero.....	Shrau-wi-ti-nī..	Tanyi.	
95.	*Savelita Akaka. f.....	Shi-wā-ūtz .....	Huashpa.	
96.		f.		Huashpa.
97.	Toñi Calabasa .....	Tzī-i-nū-tē .....	Shipewe ..	"Cloudy."
98.	*M. Louisa Trujillo. f....	Kwi-ūtz .....	Huashpa.	
99.		f....		Huashpa.
100.	José Maria Naranjo.....	I-ō-ě-ti-wā....	Hapani...	"Wind blowing."
101.	*M. Cresencia Perez. f...	Shrai-ō-wūtz ..	Isi.	
102.	Mariano Naranjo.....	Kai-ō-wē .....	Isi.....	"Dawn."
103.	Provencio Naranjo.....	Kū-o.....	Isi.....	"Otter."
104.	Tomas Suina.....	Ai-ō-wi-ti-wā..	Hapani.	
105.	*Bartola Chavez. f.....	Hā-yō-mū-tsū ..	Hitraani..	

NO.	NAME: SPANISH.	NAME: INDIAN.	CLAN.	REMARKS.
106.	Lorenzo Herrera.....	Kō-wa-ñi.....	Isi.....	"Lake."
107.	*Seferina Arcera. f.....	Tsi-sti-üts.....	Hitraani..	"Praise god."
108.	Juanito Herrera.....	Hā-kē-ä-ti-wa.	Hitraani..	Son 107 by a dead hus.
109.		Kō-rā-ñi.....	Hitraani..	Son of 106 and 107.
110.			Hitraani..	Son of 106 and 107.
111.	Todocio Cordero.....	I-ärsh-kě-ti-wā.	Yakka....	"Ray of the sun."
112.	*Juanita Padia. f.....	Hā-ä-ti-ütz....	Shipewe.	
113.	Vitorio Cordero.....	Ik-ä-ñi.....	Shipewe.	
114.	Isidro Cordero.....	Wā-kō-rō.....	Shipewe..	Name of a plant.
115.	José Trujillo.....	Tōn-hi-vē ....	Shipewe..	Grandson of 112: mother dead.
116.	Florencia Trujillo. f.....	Kwi-rai-nā....	Shipewe..	Sister of 115 and 117.
117.	Tonita Trujillo. f.....		Shipewe..	Sister of 115 and 116.
118.	Marcelina Herrera. f.....	Ha-ti-ä.....	Huashpa..	"Mountain cottonwood."
119.	Demasio Herrera.....	Hi-ä-ē-rā.....	Huashpa..	"The road." Son of 118
120.	Victor Suina.....	Tsi-ō-tsi-ti-wā..	Huashpa.	
121.	*Lopita Cordera. f.....	Kai-shrai-ä....	Tanyi....	Sister of 94.
122.	Lorenzo Suina.....	Mā-hi-ō.....	Tanyi....	"Springing maize."
123.		Hwē-wā-nā....	Tanyi....	
124.		Schrā-ä-ñi ....	Tanyi....	
125.	Rosinda Cordero. f.....	Tsě-kai-yü....	Shipewe..	Wife of 122.
126.		f. Hai-kyū-wütz..	Shipewe..	Daughter of 122-125.
127.	Juanito Herrera.....	Tsā-i-wi.....	Hitraani.	
128.	*Juanita Herrera. f.....	Shrā-ä-ti-ä....	Huashpa.	
129.	Mariano Herrera. f.....	Kā-au-ti-mě...	Huashpa..	"The sower."
130.		f. Kā-äsh-pā....	Huashpa..	"Dancing girdle."
				Child of dead daughter of 128.
131.	Manuel Ortiz.....	Tsi-wi-si-rō ...	Tanyi.	
132.	Raphael Antonio Ortiz... Ti-mi-kā.....	Tanyi....	Brother of 131.	
133.	Kerina Chalana. f.....	Shrai-ō-wütz... Tzitz	....	Wife of 131.
134.	Juanita Quintana. f.....	Hrā-ni-kü ....	Shoame.	
135.	Francisco Ortiz.....	I-é-i-ti-wā,....	Shoame..	Son of 134.
136.	Ventura Ortiz.....	K'ā-i-ä-ti-wā..	Shoame..	Son of 134.
137.	M. Vitoria Ortiz. f.....	Tsi-ü-ti-ütz ...	Shoame..	Daughter of 134.
138.	Luis Ortiz.....	Tsi-ü-kā.....	Shoame..	Child of 134.
139.		f.	Shoame..	Daughter of 134.
140.		f.	Shoame..	Daughter of 134.

NO.	NAME : SPANISH.	NAME : INDIAN.	CLAN.	REMARKS.
141.		f.		Shoame... Daughter of 134.
142.	Santiago Akaka.....	I-wi-yä-ni.....	Hitraani.	
143.		Ä-yö-lis.....	Huashpa..	Son of 142.
144.		Tsin-ä-ti-wä...	Huashpa..	"Turkey." Son 142.
145.	Antonio Challan.....	K'ä-ti-ä.....	Hitraani.	
146.	*Juanita Perez. f.....	Shrai-ö-i-tsü...	Tzitz.	
147.		f. Tsai-ö-wi-tsü..	Tzitz.	
148.		f. Tö-ötch.....	Tzitz.	
149.		f.	Tzitz.	
150.	M. Gilia Arcera. f.....			Hitraani.. Widow.
151.		Tö-rä-ni.....	Hitraani..	Son of 150.
152.		Bö-ni-a.....	Hitraani..	"The west." Son 150.
153.	Juan Arcero.....	Wai-ti-yä.....	Hitraani.	
154.	*Inez Mokina. f.....	Kä-ét-ütz.....	Huashpa.	
155.	Cleito Arcero.....			Huashpa.
156.	Clovis Arcero.....	Maish-ti-wa...	Huashpa.	
157.	Reyes Melchoir. f.....	Ki-äñ-i-ütz...	Shoame...	"Deer."
158.	Lociyita Ortiz .f.....	Si-yät.....	Hapani.	
159.	Juanita Arcera. f.....	Si-shrä-ya.....	Hapani...	"The name." Daughter of No. 158.
160.	Mariana Arcera. f.....	Mä-ä-pës.....	Hapani...	Name of a Mexican bird, Daughter of 158.
161.		f.	Hapani...	Daughter of 158.
162.		f.	Hapani...	Daughter of 159.
163.	Natividad Arcero.....	Ki-ä-mi-ti-wä..	Hapani...	"Eagle."
164.	*Juanita Chavez. f.....	Kö-ti-mi-në...	Hitraani.	
165.		f. Mi-trai-yä.....	Hitraani..	Daughter of 163-164.
166.		f. Há-wai-ütz...	Hitraani.	
167.				Hapani... Son of an outsider.
168.	José Francisco Pancho...	Tsai-ya-i-ti-wä.	Hitraani.	
169.	*Reyes Urbana. f.....	Shrä-i-mütz ...	Hapani.	
170.	Juanito Pancho.....	Tsi-kö-ra.....	Hapani.	
171.		f. Tsai-tsi-ütz,...	Hapani...	Now at Sandia.
172.	Juan Pedro Melchoir....	Shwe-ya-ti-wä.	Hitraani.	
173.	*Ignacia Montoya. f.....	Shrai-ki-wi-ütz.	Hitraani.	
174.		Shpa-ä-ti.....	Hitraani.	
175.	Pablo Melchoir.....	Kwi-ya-ti-wä..	Hitraani.	

NO.	NAME : SPANISH.	NAME : INDIAN.	CLAN.	REMARKS.
176.	Serafine Quintana.....	Shkō-rō-ti-wā.	Shoame...	Widower.
177.	Petra Quintana. f.....	Shrā-yō-ri-ūtz.	Tzutsuna.	Daughter of 176.
178.	Dominga Quintana. f....	Kā-yō-tits	Tzutsuna.	“Singing.” Dau. 176.
179.	f.		Tzutsuna.	Daughter of 177.
180.			Tzutsuna.	Son of 177.
181.			Tzutsuna.	Son of 177.
182.	Rafaelito Calabaza.....	Hā-trū-tsě.	Shipewe...	“Man.”
183.	*Cecilia Arcera. f.....	Ki-wä-tit.	Shoame.	
184.	M. Domiguita Chavez. f.	Tō-gō-ñē	Shoame...	Daughter of 183.
185.		Ki-ā-tē-rā-ñū..	Shoame...	Son of 183.
186.			Shoame...	Son of daughter of 183.
187.	Louisa Romera. f.....	Kā-ā-yōkū	Shoame.	
188.	Luis Romero.....	Mō-kā-ātch	Shipewe ..	Son of brother of 187.
189.	Santiago Romero.....	Ki-ai-shrō-tē..	Shipewe..	Son of brother of 187.
190.		f. Kā-chi-ūtz	Shipewe ..	“Falling rain.” Daughter of the brother of 187.
191.	Santiago Arcero.....	Tsi-yō-ti-ti-wa.	Hitraani.	
192.	*M. Merced Montoya. f.	Shki-yār-ūtz.	Huashpa.	
193.		Shro-ñi-ā.	Huashpa.	
194.	f.		Huashpa.	
195.	Natividad Arcero.....	Shwi-yā-ri	Shoame.	
196.	*Toñita Montoya. f.....	Shi-wi-yā-ně..	Tzutsuna.	
197.	Stephana Arcera. f.....	Hā-ni-ūtz.	Tzutsuna.	
198.	Pomosena Suina.....	Tsi-ō-wi-ti-wa.	Hapani.	
199.	*Rofina Chavez. f.....	Tsi-ō-kōsh.	Isi.	
200.	Juan José Suina.....	Koi-ā-shtō-lō..	Isi.	
201.		f. Shi-ti-yā.	Isi.	
202.	Juan Isidro Trujillo.....	Si-rō-ni	Oshatch.	
203.	*Lorenzita Arcera.. f....	Kai-yā-ūtz	Tzitz.	
204.	f.		Tzitz.	Daughter of 203.
205.	f.		Tzitz.	Daughter of 202 and 203
206.	Vicente Arcero.....	Hi-shi-ti-wā..	Tzitz.	
207.	*Inez Ortiz. f.....	Kō-i-nütz.	Shoame.	
208.		f. Tsür-tski-yū..	Shoame...	“Flower of the Calabash.”
209.	Santiago Cordero .....	Tsi-ō-tē-ti-wā..	Yakke.	
210.	M. Pereseliana Cordera. f.	Tsi-kai-ūtz.	Tzitz.	Daughter of 209.

NO.	NAME: SPANISH.	NAME: INDIAN.	CLAN.	REMARKS.
211.	Juan Rosario Quintana	Tsi-wā-tč	Shoame.	
212.	*Anna Suina. f.	Kai-wi-ütz	Huashpa.	
213.	Miguela Quintana. f.	Shrā-ti-ā-ñi	Huashpa..	Widow.
214.		Shō-rō-ā	Huashpa..	Son of 213.
215.		Tsi-li-ā	Huashpa..	Son of 213.
216.			Huashpa..	Son of 213.
217.	José Cordero	Ki-mā-ti-wā	Yakke.	
218.	*Dominga Suina. f.	Nai-ti-yā	Huashpa.	
219.	Miguel Suina	Ā-hwē-rō	Huashpa..	Son of 216, by former husband.
220.	*Lopita Moriaga. f.		Hitraani.	
221.		f.	Hitraani..	Daughter 219 and 220.
222.	Nicanor Cordero	Sēr-si-shrō-wi	Huashpa..	Son of 217.
		ti-wā.		
223.	Santiago Cordero	Wā-yi-i	Huashpa..	Son of 217.
224.	Lorenzita Arcera. f.	Hai-shrō-mi-ütz	Hapani..	Daughter-in-law of 217.
225.		f. Nā-wā-shrā-ütz	Hapani..	Daughter of 224.
226.		f. Hō-li-ütz	Hapani..	Daughter of 224.
227.			Huashpa..	Small son of 217.
228.	Vivian Perez	Ki-yā-ū-lū	Tzitz.	
229.	*Refugia Pancha. f.	Shrai-mā-ütz	Hitraani.	
230.	José Maria Perez	Ā-tē-wā	Hitraani..	Son of 228 and 229.
231.	*	f. Tsā-trai-yū	Huashpa.	
232.			Huashpa..	Son of 230 and 231.
233.	Ysidro Perez	Kār-shki-ütz	Hitraani..	Son of 228 and 229.
234.	Juan Aguilar Perez	Wēk	Hitraani..	Son of 228 and 229.
235.	Salvador Perez.		Hitraani..	Son of 228 and 229.
236.	Margarita Perez. f.	Ō-shā-tūtz	Hitraani..	Daughter 228 and 229.
237.	Alvanita Perez. f.		Hitraani..	Daughter 228 and 229.
238.	Cleito Urina	Shrai-si-wi	Shipewe.	
239.	Anastasio Urina	Ēsh-kātch	Tzitz.	
240.	Sebastian Urina	Hā-kük-ti-wā	Tzitz.	.... "Great pine."
241.	Miguela Arcera. f.	Ār-shō-ütz	Shipewe..	Orphan.
242.	José Francisco Archeveque	Tsi-ō-ti-wā	Shipewe.	
243.	*Sanatana Ortiz	f. Tsi-shi-wū-nā	Tanyi.	
244.	José Miguel Archeveque	Kwi-yā-i-ti-wā	Tanyi.	
245.	José Hilario Montoya	Shtē-ra-ñi	Huashpa..	Governor of the Pueblo.
246.	*Juana Maria Herrera. f.	Ki-ā-ütz	Yakke.	

NO.	NAME: SPANISH.	NAME: INDIAN.	CLAN.	REMARKS.
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247.	José Alcario Montoya.....	Ā-pōtch.....	Yakke.	
248.	Manuel Montoya.....	Tsār-shrō-mā..	Huashpa..	Son of sister of 245.
249.	Juan Antonia Herrera...	Tsō-wā-si-rō ..	Hitraani.	
250.	*M. Luz Suina f.....	Tsi-tsi-ūtz ..	Hapani.	
251.	M. Dominga Herrera. f.	Tsā-shrō-mi-ūtz.	Hapani.	
252.	José Domingo Challan...	Hā-wi-rā-nā...	Tzitz.	Husband of 251.
253.	Rafaelito Lecheguayavi...	Shrā-ā-yā-ti-wa.	Tzutsuna.	
254.	*Kerina Urina. f.....	Hā-kiā-yā ..	Huashpa.	
255.		f.	Huashpa.	
256.	Santiago Quintana.....	Ki-ē-kā-yā ..	Tzutsuna.	Lieut.-Gov. of Pueblo.
257.	*	f.Kō-li-yā ūtz ..	Hapani.	
258.			Hapani.	
259.	Augustinito Benadito....	Kai-ō-wi-ti-ti-	Hitraani.	wā.
260.	*Anna Cordera. f.....	Kō-trā-yā-ūtz..	Tzutsuna.	
261.		f.Tsi-kō-wi-ūtz ..	Tzutsuna.	
262.		f.Ā-yō-wi-ūtz ..	Tzutsuna.	
263.	José Siyero.....	Tsi-wai-i-ti-wā.	?	
264.	*	f.l-ā-ūtz.....	Tzutsuna.	
265.	Antonio Lucero Siyero ..	Kā tī-yā si-rō..	Tzutsuna.	
266.			Tzutsuna.	
267.	M. Encarnacion Cordera.f.	Wā-ā-rū-mi ..	Tanyi....	Widow.
268.	Juanito Chavez .....	Mi-itch.....	Tanyi....	Son of 267.
269.	*Inez Cordera. f.....	Hā-ā-ti-ūtz....	Shipewe.	
270.		f.Ski-ā-ri-ūtz....	Shipewe.	
271.		f.Mai-yā-rō-ts...	Shipewe.	
272.		Mai-ā-rō-ti-wā.	Shipewe.	
273.			Shipewe.	

In the above enumeration horizontal lines separate the members of one household from those of another. The first name in the household group is that of the head of the house, man or woman. The Spanish name is given: then the Indian name: then the clan. Under the heading "remarks" are given (a) the significance of the Indian names, necessary data regarding relationships, or facts of interest concerning the individual. An \* before a woman's name indicates that she is the wife of the man just before named. Names immediately following those of a married couple are those of their children, unless otherwise

stated. All names of females are marked with an f on the same line. In giving the Spanish names the informants' pronunciation have been closely followed. A curious variation in family names with variation in sex will be noticed:—the family name for males may end in ó, while for females it ends in a; e. g. Arcero, Arcera. Surprisingly few of the Indian names are significant: it is certain that some which are significant have not been translated, but it is equally sure that a large number of them are today "simply names." Where no names at all are given the individuals were mostly little children, whose names were unknown to or forgotten by my informants. The Indian names are spelled phonetically and are marked to indicate pronunciation; markings were considered unnecessary in the other columns. Two persons in the list—Nos. 61 and 263—could not at the moment be located in the manner of clan, by my informants. This fact in itself renders it certain that they do not belong to any clan not mentioned and as both are males ignorance with regard to them will not affect any conclusions drawn.

With these words of explanation we may examine the tables and draw a few conclusions of interest. To completely work out the possible results would defeat one of the objects in view. Simple counting enables us to construct the following table:

CLAN NAME.	NUMBER OF MALES.	FEMALES.	TOTAL.
Tanyi .....	10 .....	5 .....	15
Hapani .....	12 .....	22 .....	34
Tzitz .....	6 .....	9 .....	15
Hitraani .....	27 .....	24 .....	51
Tzutsuna .....	10 .....	12 .....	22
Huashpa .....	23 .....	20 .....	43
Oshatch .....	4 .....	0 .....	4
Isi .....	21 .....	12 .....	33
Shoame .....	13 .....	11 .....	24
Shipewe .....	14 .....	11 .....	25
Yakke .....	4 .....	1 .....	5
<hr/>		<hr/>	
	144	127	
Unlocated .....	2		
<hr/>		<hr/>	
	146	127	273

Eleven clans exist to-day at Cochiti according to this census. Their English names in the order above given are calabash, scruboak, water, cottonwood, coyote, Mexican sage, sun, ivy, turquoise, sage (Shipewe), maize. Comparing this list with the one given by Bandelier we fail to find three that he names—panther, bear, fire. On the other hand he fails to name one that occurs here—probably

Shipewe—"a kind of sage" Santiago Quintana says he does not think there has been a clan of the panther, or of the bear; at all events there have been no such within his memory. He has known several that have died within that period — viz.: Kütz (wood), Hā-kū-ñi (fire) and Kir-shrā (elk).

The clan *os Hatch* is now reduced to four men and no women. Left to itself, it must disappear with their death. The clan *yakke* is really no better off. The only woman remaining has but one child and that is a boy. She is well on in years and is little likely to have daughters. With her death the last natural hope of the clan is gone. In all such cases there is one chance of perpetuating the clan — that is by the adoption into it of a girl from another clan. Juan de Jesus Pancho, who is well informed, tells me that this adoption was really performed recently in the case of the fire clan. He asserts that the last man of the Hakuñi, before dying, adopted a girl named Kē-ai-ti-ütz, who still lives to continue the clan. Quintana, however, insists that such an action is not recognized unless the proper officials are notified and says that if adoption took place in this case it is not valid for lack of proper declaration and recognition.

Many suggestions regarding ideas of relationship come to the mind on a careful examination of the tables. The mere fact that, in the enumeration, the man's name appears first in each household shows the giving away of the old views regarding woman headship. The ancient idea of kin grouping, however, appears in many cases. Thus in the first household listed, while Santiago's name heads the list it is easily seen that the household is one of *Hapani*. Santiago's wife, not he, is the social centre. She and her daughters hold the house. He and his daughters' husbands representing *Tanyi*, *Tzitz* and *Hitraani* are tolerated therein.

Another evidence of the giving away of the old conditions before the new is the fact that the children, though of the mother's clan, bear the father's family name. Interesting, however, is the fact that while this is true, the girl does not change her name when she marries. Her *children* may take their father's name, but she does not.

That No. 50 should live with No. 48 is in full accord with old ideas. José Francisco is the son of Adelaido's sister and he can have no nearer relative among men than his maternal uncle. The boy is nearer related to his uncle than the little girl No. 51 is, although she is Adelaido's own daughter. That Ventura Cordero, No. 29, should live with his father Santiago Cordero, No. 27, after his mother is dead or married elsewhere, is entirely discordant with ancient views and only explicable on the breaking down of the old and the setting up of the new system.

Several times in the tables—Nos. 48.49, 72.73, 88.89, 172.173,—we observe a striking fact, the marriage of members of the same clan. Such a thing was not tolerated under the old system. Juan Pedro Melchoir and Ignacia Montoya, as

being both Hitraani, could never have become man and wife. The sanction of the new creed has here broken down the ancient barrier. Membership in one clan is not necessarily relationship so close as to fall under the ban of the Church of Rome. The Indian yields to the church decision and to inclination and the wedding takes place.

The total population of Cochiti, which is one of the Queres group of Pueblos, is now 273 persons—males 146, females 127. It is probable that just now the number is growing. At the taking of the government census in 1890 there were 309 inhabitants. In 1894 came the terrible "mountain fever;" many died—26 in a single week. In the summer of 1895 a second attack carried off many others. But for the last two years the smitten community has prospered.

## STUDIES OF NORTH AMERICAN JASSOIDEA.

BY HERBERT OSBORN AND ELMER D. BALL.

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THE studies recorded in this paper may be considered a continuation of those presented before the Iowa Academy of Sciences and published in Vol. IV., p. 172, (1897) under the title "Contributions to the Hemipterous Fauna of Iowa."

As in that paper, the special effort has been to detail the life-histories of the various species and is mainly concerned with common species occurring in Iowa; but in a number of instances it has been necessary, in order to present a systematic arrangement of the known forms, to include the species occupying all portions of North America and in some instances to describe those which are new to science. The studies have been prosecuted primarily for the purpose of determining the economic relations and importance of this group of insects and securing such facts as may furnish a scientific basis for dealing with those that are injurious to crops of the State. A paper dealing more particularly with the practical questions involved will appear in the report of the Iowa Experiment Station for 1897.

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## A REVIEW OF THE NORTH AMERICAN SPECIES OF AGALLIA.

The members of this genus are all small and sombre-colored; the individuals of a species vary little in pattern, but much in depth of color; the males are invariably smaller and darker than the females. They are all single-brooded as far as known, the larvæ being usually found in the rubbish on the ground around the base of their respective food plants from which they emerge to feed, those of the first two groups maturing in the fall and passing the winter as pupæ to issue as adults in early spring; those of the third group occurring in early summer, the adults appearing in July and August and hibernating to deposit eggs in early spring.

The genus may be characterized as follows: Head, together with the eyes, wider than elytra at base; vertex transverse, crescentiform; ocelli on the face between the eyes; antennæ long, inserted under a feeble ledge, their bases partly visible, clypeus longer than wide, nearly rectangular; face as long or longer than width across eyes; pronotum long, anterior margin strongly rounding and extending forward below the eyes, side margin short or obsolete; elytra without an appendix; five apical and three anteapical cells; second transverse nervure sometimes present; marginal nerve of wing continued around apex, forming a supernumerary cell; color varying from whitish to dark fuscous, scarcely ever more than a trace of red, yellow or green, two round black spots on vertex rarely wanting.

The North American representatives of the genus may be readily divided into three groups, easily separable on adult characters, but which are even more strongly marked in those of the larvæ and in the life histories.

The species of the first group have the pronotum finely granulated without transverse striations, ornamented with two large spots near the posterior margin; the vertex is nearly parallel, the front expanded on the basal part; elytra brownish with light nervures, the base of the apical cells in a transverse line. The known larvæ are compact, reddish brown forms with long wing pads and compressed, dorsally, serrately carinate abdomen. Eyes much wider than the pronotum, which they partly enclose. The vertex is nearly flat above with two lobe-like projections arising from the anterior margin against the eyes and extending forward, or forward and inward, giving the insect a very grotesque appearance. They are found in the rubbish around the base of different plants, but only in moist and shady places. Of the group, *4-punctata* and *constricta* are typical representatives in their respective habitats and are closely related to the European *sinuata*.

In the second group the pronotum is finely granulated as in the first, but the two round spots are near the middle. The posterior margin of the vertex is elevated and carried forward between the eyes, appearing as a transverse line in the middle, front wedge-shaped, broad but not distinctly lobed above. The elytra are long and narrow and the apices of the anteapical cells are nearly in line. The larvæ are reddish-brown in color like those of the first group and are similar in form except the vertex. The entire posterior margin of the vertex is elevated and carried obliquely upward and forward before the eyes on the same plane as the face, the upper carinate margin being shallowly

roundingly bilobed. They are found in similar situations with those of the first group, and while in appearance the lobate form of the vertex in the two groups is not strikingly different, yet when it is borne in mind that in the first case the lobe is simply an inflation of the anterior margin, while in the second it is the reflexed and elevated posterior margin, the difference in form of the adult vertices is readily understood.

The third group is characterized by a transversely striated pronotum on which the dark markings, if any, are in longitudinal bands and not in round spots on the posterior half. The front is very broad and suddenly constricted to meet the clypeus. The elytral nervures in the terminal portion are usually darker and more or less irregular, the central anteapical cell extending beyond the others. The larvæ are light-colored with dark lines, small, compact form, with a rounded parallel-margined vertex very similar to that of the adults, and short, elevated abdomen. They apparently prefer dry and exposed situations. This group includes the last five species, of which *sanguinolenta* is abundant and widely distributed and is closely related to the European *venosa* and the South American *signata*.

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#### SYNOPSIS OF THE SPECIES.

- A. Pronotum very finely, evenly granulated, posterior half of disc with two round black spots slightly farther apart than those on the vertex.
- B. Posterior margin of vertex a regular curve or nearly so, vertex very narrow or obsolete behind the eyes, spots on pronotum close to posterior margin, sutural margin of elytra unicolorous.
  - C. ♀ segment slightly narrower behind than in front, without an abrupt constriction; posterior margin truncate; ♂ plates broad at base, regularly narrowing to an acute tip. Specimens usually unicolorous except for the four black spots.
    - D. Broad and stout, nearly 2 mm. wide; elytra convex, short. .... *punctata*, Prov.
    - DD. Narrower, wedge-shaped, elytra longer proportionately. .... *modesta*, n. sp.
  - CC. ♀ segment suddenly constricted and depressed near the middle; ♂ plates constricted in the middle, the tip enlarged, rounding; specimens usually with strong accessory markings.
    - D. Small, less than 4 mm. long, ♀ segment broadly rounding behind. .... *constricta*, V. D.
    - DD. Larger, over 4 mm. long, elytra over 1 mm. longer than body; ♀ segment with the posterior margin much produced, side concave. .... *producta*, n. sp.

BB. Posterior margin of vertex elevated and carried forward in the middle, vertex margining the eye behind, narrowing away toward the outer margin, spots on pronotum nearer the middle than the posterior margin, sutural margin of elytra usually light.

C. Species narrow, little more than 1 mm. in breadth, only one spot on vertex next eye.

    D. ♀ segment deeply roundingly emarginate, central apical cell of elytra parallel margined..... *novella*, V. D.

    DD. ♀ segment roundingly produced, the apex with a shallow notch, elytra very long with the central apical cell wedge-shaped..... *tenella*, n. sp.

CC. Species broader, nearly 2 mm. in width, three dark points on vertex next each eye, elytra maculate..... *oculata*, V. D.

AA. Pronotum coarsely transversely rugulose except for two spots on the anterior margin, dark markings absent or in the form of longitudinal bands.

B. Species light cinereous or whitish, spots on vertex small, elytra subhyaline, nervures light.

    C. Elytra much longer than abdomen, narrow behind, costa nearly straight, ♀ segment long, deeply cleft..... *uhleri*, V. D.

    CC. Elytra short and convex, only slightly exceeding abdomen, ♀ segment short, only slightly notched, *cinerea*, n. sp.

BB. Species darker, the spots on vertex large, usually with other markings, elytra subhyaline or fuscous, the nervures distinctly darker.

    C. ♀ segment with posterior margin deeply cleft, (♂ plates narrow, tubular).

    D. Species stout, elytra broadly convex, ♀ segment with four triangular points, ♂ plates narrower behind..... *bigeloviae*, Bak.

    DD. Species smaller, wedge-shaped, ♀ segment with two lateral points, ♂ plates tubular..... *gillettei*, n. sp.

    CC. ♀ segment nearly truncate behind, slightly notched. (♂ plates broad, nearly flat)..... *sanguinolenta*, Prov.\*

\* The *peregrinans* of Stal if, as believed, belonging to *Agallia* and including specimens we have from California, would fall in this synopsis next to *sanguinolenta*, but differing from that species, particularly in the form of the male plates.

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AGALLIA 4-PUNCTATA Prov. (Plate I., Fig. 1.)

*Bythoscopus 4-punctata*, Nat. Can., IV., p. 376, 1872.  
*Ulopa canadensis*, V. D. (nymph). Trans. Amer. Ent. Soc., XIX., p. 301, 1892.

Short and stout; elytra broad, convex, at rest wider than across the eyes; uniformly smoky-gray above except for two black spots on the

vertex and two near posterior margin of pronotum. Length of ♀ 4 mm., width, 1.75 mm; ♂ slightly smaller.

Vertex short, transverse, more than five times wider than long, posterior edge crescentiform, slightly arcuated and elevated from the pronotum, anterior edge rounding to the face. Face broad and short, outer angle of the genæ prominent. Front broad and short, superior third abruptly expanded over the antennal bases, suture above nearly transverse, slightly arcuated and angled medially. Pronotum very finely punctured, more than twice wider than long, anterior margin strongly produced between the eyes, broadly depressed either side of the middle, lateral margin obsolete, the humeral margin touching the eye, posterior margin slightly emarginate. Scutellum equilaterally triangular, the apex produced. Elytra broad, convex, slightly longer than abdomen; at rest the costal margins are wider than across eyes, giving the insect a very compact appearance; venation very constant with the exception of the second cross nervure, which is often wanting, the bases of the four inner apical cells in a transverse line. Abdomen slightly crested.

Color: Above, obscure yellowish-brown, vertex yellowish-brown with two oblique black spots equidistant from each other and eyes, a faint brownish median line extending down to frontal suture, below which is lined with darker, antennal pits broadly black, facial sutures and tip of clypeus dark brown, sometimes brownish arcs on front, emphasized in two lateral rows of fuscous points. Pronotum yellowish-brown, darker in front, two distinct black spots near the posterior margin slightly larger and farther apart than those on the head. In highly colored examples there appears a median brown line, an oblique crescent near the humeral margin, and the anterior depressions become much darker. Elytra uniformly smoky subhyaline with lighter nervures, tergum and venter varying from yellow to fuscous, last ventral segment and genitalia light-yellow in both sexes.

Genitalia: ♀, ultimate ventral segment broad, slightly narrowing behind, anterior and posterior margins parallel, posterior margin usually arcuated or angularly elevated, giving it an emarginate appearance; pygofer broad and short, less than twice the length of the ultimate segment. ♂: Valve large, twice broader than long, lateral margin enclosing base of plates, posterior margin obtusely medially produced, plates together forming a triangle slightly longer than wide at the base, one-half longer than valve.

Specimens are at hand from Ont., N. Y., N. H., D. C., Ia., Kans., Ky., Ark., Neb., and Colo.

**Nymph:** Compact, reddish-brown, with prominent eyes, stout, short legs, vertex prolonged on either side of the middle third into a flat process, abdomen with a median notched carina; length, 3 mm.

Vertex nearly flat, projecting forward, parallel-margined for more than half of its length in front of the eyes, middle third of anterior inmargin cleft half-way to base, leaving two flat "horns" longest on lateral margins, where they equal their width at base, their anterior margins obliquely rounding to the medial cleft, face similar to adult, upper part of front projected on either side into an elevated rounded lobe which overhangs the base of the long antennæ, thoracic shield equalling the abdomen in length, medially carinate, abdomen short and narrow, above compressed into a high keel, each segment being elevated most on the posterior margin, giving it a serrate appearance. Legs stout, more adapted to walking; whole surface roughly and irregularly pitted.

While at first sight this appears to be a very distinct form it agrees with the *Pediopsis* larva in the crested abdomen and except for the projections on the vertex bears a striking resemblance to the larva of *Tettigonia bifida*.

**Life history:** Larvæ and pupæ were collected first October 12 of last year and were determined to be *U. canadensis*, V. D., and so reported in the "Additions to List of Hemiptera of Iowa."\* They were again collected from sheltered situations January 1, 1897, (a very warm day). Early in May they were again found and placed in breeding cages and soon emerged as *Agallia 4-punctata* females, the males probably having issued before. They are single-brooded, the adults appearing in early spring, the females remaining until into July. The eggs are probably all deposited by the middle of June, from which the larvæ appear in July and by fall are nearly or quite full grown, passing the winter and issuing as adults again early the next spring. They have been found on a great variety of plants, mostly pertaining to the compositæ, horse-radish, beet, *Helianthus*, *Eupatorium*, etc. The larvæ remain on or near the ground and conceal themselves in the rubbish and humus for which their color and appearance is peculiarly adapted. They only occur in shaded locations or on such plants as horse-radish, beets, etc., that furnish a deep shade and a moist humus. The adults are usually found on the younger portions of the stems and may be taken in abundance from *Eupatorium* in May.

\* Proc. Iowa Acad. Sci., Vol. IV., p. 231.

## AGALLIA MODESTA n. sp.

Form of *constricta* nearly but smaller, smaller and narrower than *4-punctata*, superior portion of front less dilated; elytra much narrower. Length, ♀ 3.75–4 mm.; ♂, 3 mm.

Vertex narrow, rounding from the elevated posterior margin, giving it the appearance of a crescentiform elevated ridge; margin behind eye very narrow, nearly obsolete. Face narrower than in *4-punctata* or *constricta*, the outer angle of the genæ farther from eye, more obtuse. Front with the superior third widest at base, from which it rapidly and evenly narrows instead of being parallel-margined and abruptly narrowing, remainder of front slightly narrower and longer than in *4-punctata*. Pronotum finely punctured, twice wider than long, lateral margin obsolete, humeral margin short, posterior margin straight, very long, whole outline very nearly a semicircle as in *constricta*. Elytra long and narrow, similar to those of *constricta*; at rest they are folded at an acute angle above; costal margin not convex, giving a wedge-shaped appearance to the insect; venation similar to *4-punctata*, apical cells longer, entirely beyond tip of abdomen.

Color: Light yellowish-brown with four round black spots located as in *4-punctata*. Vertex and face light-yellow, with a pair of large rounded spots on the superior margin equidistant from each other and eyes, a narrow margin around the ocelli and the antennal pits black, a narrow median line on the vertex, one either side next eye, light ferruginous, clypeus and all of front except a narrow median stripe on inferior half, and a spot near superior margin reddish-brown. Pronotum light-yellow with two round spots slightly farther apart than those on the vertex and less than their own diameter from posterior margin, black, an indistinct median line, two spots in the depression of the anterior margin and sometimes a mark on the humeral margin, reddish-brown. Elytra smoky and hyaline, nervures lighter; very dark examples may have the reddish-brown marking on the clypeus, front and pronotum changed to a dark chestnut and the elytra to a dark smoky, the black spots on the back of the pronotum enlarged, and the reddish-brown markings on the anterior margin localized into two small approximate round dots.

Genitalia: ♀, ultimate ventral segment slightly longer than penultimate, the sides parallel, posterior margin truncate, posterior part of segment curved around base of ovipositor, ovipositor proportionately longer and narrower than in *4-punctata*. ♂, ultimate segment short,

light-yellow, valve long encircling the base of the plates; plates together wedge-shaped, somewhat longer than their width at base, slightly constricted one-third the distance from tip.

Described from seventeen examples collected in Mexico (Osborn). Readily separable from *4-punctata* by the narrower form and from *constricta* by the truncate ♀ segment.

#### AGALLIA CONSTRICTA V. D.

Can. Ent., XXVI., p. 90, 1894.

Size of *modesta* nearly, but with shorter elytra, smaller than *4-punctata*, elytra less convex, light testaceous with four black spots as in the former species. Length, ♀ 3.50-4 mm; ♂ considerably smaller.

Vertex proportionately wider than *4-punctata*, posterior margin slightly elevated, anterior margin rounding to the face. Front broad at the base, suddenly narrowing before the middle, from there convexly narrowing to the clypeus. Pronotum similar to *modesta*, longer than in *4-punctata*, humeral margin more oblique than in *modesta*, posterior margin truncate or very slightly excavated. Elytra longer and narrower than in *4-punctata*, folded perpendicularly together at the tip, obliquely at base, only slightly convex.

Color: Light testaceous yellow, two round spots on vertex, two more on posterior margin of pronotum and the antennal pits black, a narrow median line on pronotum and vertex, the facial sutures, a narrow line next each eye, an oblique mark on the humeral margin of pronotum and two approximate spots near the anterior margin brownish testaceous.

Genitalia: ♀, ultimate ventral segment long, nearly parallel-margined, posterior half abruptly constricted, roundingly depressed on either side a carinate median line, posterior margin obtusely rounding. ♂, valve long, compressed; plates long and narrow, broadest at the base, constricted in the middle, widening again to the rounding tip; pygo-fers prominent, laterally compressed, about equaling the plates.

Specimens are at hand from Long Island, N. Y., D. C., N. J., Ky., Fla., La., Miss., and Texas. Readily separable from the two preceding by the constricted ♀ segment.

#### AGALLIA PRODUCTA n. sp.

Form of *constricta* but longer, as large as *4-punctata*, with longer, narrower elytra. Dark smoky-brown, with larger black spots arranged

as in the preceding species. Length, ♀, 4.5 mm., width, 1.50 mm.; ♂ smaller.

Vertex: Width as in *constricta*, over six times wider than long, posterior margin roundingly angular as in *Pediopsis*, slightly elevated. Face broad and short, genae parallel-margined below eyes one-third the length, then sharply angulate and straight-margined to the clypeus. Front intermediate in form between *modesta* and *constricta*, broad at base, roundingly narrowing on basal third, abruptly constricted, then slightly, convexly narrowing to the clypeus. Pronotum convex, finely granulose, twice wider than long, humeral margin long, posterior margin truncate. Elytra much longer than in *4-punctata*, costal margin less curved, less convex, apical and antecapital cells longer. Second cross nervure not present in any of the specimens in hand.

Color: Dark fuscous-brown and light-gray in strong contrast. Vertex and face light-yellow, with the round spots on vertex and antennal pits black, facial sutures, margins of ocelli, a band on either side of the front and the lower half of clypeus, dark reddish-brown, median line of vertex and one margining either eye light reddish-brown. Front, above and outside of dark band, suffused with reddish. Pronotum and scutellum light-yellowish, a pair of roundingly triangular spots near posterior margin of pronotum black, a median line sometimes expanded on posterior margin of pronotum and again near tip of scutellum, an oblique mark on humeral margin of pronotum, a spot on either side of the median line on its anterior part and a spot near the basal angle of scutellum reddish-brown. Elytra dark smoky-brown with pale nervures and sutural margin in strong contrast.

Genitalia: ♀, ultimate ventral segment very long, posterior part constricted more strongly than in *constricta*, the division often appearing as a fold or "tuck," which is deepest at the margin, growing shallower and curving backwards near the median line, posterior margin strongly concavely produced from the lateral angles, tip of produced part truncate but often angularly elevated, giving the impression of a slight median notch, the produced part being two-thirds of the whole constricted portion, pygofer about three times longer than wide. ♂ genitalia similar to those of *constricta*, the valve shorter and more prominent, the plates broader at the tip and less constricted medially. Described from ten examples collected January 12, at Orizaba, V. C., Mexico, (Osborn).

Readily separated from *4-punctata* by the length of the elytra and

the genitalia; from *constricta* by the larger size and the much more produced ♀ segment.

A larva collected at the same time evidently belongs to this section of the genus, and from its large size apparently to this species, and will be described here.

Larva: Form very similar to that of *4-punctata*, slightly larger with the anterior "horns" much more produced, resembling the structure found in the beetle, *Boletotherus bifurcus*. Length, 3.25 mm. Vertex much narrower than the prominent eyes which margin the pronotum on the sides, median third of vertex consisting of a thin, slightly elevated plate with a broadly rounding anterior margin; between this and the eye, on either side, arises a long obovate anterior process over three times longer than width at base; these are slightly inclined toward each other so that their elevated inner margins almost touch at the broadest point. Pronotum over three times wider than long, anterior and posterior margins parallel, wing pads very long and narrow, abdomen short, laterally compressed, carinate as in *4-punctata*, the whole surface armed with bristle-bearing papillæ, largest on abdomen and on the margins of the anterior processes.

Color: Obscure reddish-fuscous above, marked with white as follows: A narrow margin on the anterior processes, a large triangle on the vertex, its base including all the anterior margin between the horns, the apex continuous with a median line across the thorax, a narrow line on the lateral margin of the pronotum extended back to inner angle of the wing pads, a curved line just inside of these and a few oblique lines on the wing pads; beneath, fuscous, legs and genitalia lighter.

AGALLIA NOVELLA, Say. (Plate I., Fig. 2.)

*Jassus novellus* Say. Jour. Acad. Nat. Sci., Phila., VI., p. 309, 1831.  
*Macropsis nobilis* Forbes. Fourteenth Rept. Ill. St. Ent., p. 22, 1884.

Narrow, wedge-shaped, testaceous-brown with four points on anterior margin of vertex and two small spots just back of the middle of the pronotum, black, the sutural margin of the elytra light, twice interrupted with dark. Length, ♀ 3.75 mm.; width, 1.25 mm. ♂ slightly smaller.

Vertex very short, extended broadly around behind eyes until just before the outer margin, where it is suddenly constricted, posterior margin with the middle half abruptly elevated and carried forward.

Face moderately long, genæ slightly constricted below eyes then rounding to the middle of loræ. Suture above the front angulated, front long, rapidly concavely narrowing on basal third, then slowly convexly to clypeus, loræ twice longer than broad. Pronotum finely granulated twice wider than long, half the length within the curve of the vertex, side margin entirely wanting, humeral margin short, rounding, posterior margin truncate, long, anterior margin elevated and produced on the middle half, laterally depressed and covered by the vertex. Elytra long and narrow, extending over one-third their length beyond the tip of ovipositor.

Color: Light-testaceous, sometimes varying to slate color on the elytra, especially in the males. Pronotum testaceous with a dark-brown median line, a small round black spot just behind the middle of either side. Vertex testaceous or yellowish with a median line extending to the angle of the frontal sutures, a pair of round spots on posterior (superior) margin slightly farther from each other than from the eyes, black, facial sutures testaceous to light slate, nervures and sutural margin light, tips of the claval nervures broadly white with a dark saddle them which interrupts the light sutural line. Below, variable from between yellow to black except the genitalia, which are light-yellow.

Genitalia: ♀, ultimate ventral segment very long on lateral margins, posterior margin deeply circularly excavated from the lateral angle over half way to the base, pygofer narrow, moderately long, slightly exceeded by the oviducts. ♂, valve two-thirds as long as width at base, truncate behind; plates long, nearly as wide as the valve, parallel-margined, nearly truncate behind; pygofer large, inflated, convex, forming a hollow, box-like organ as seen from below, with a nearly square opening, which the plates close like a lid; seen from the side they are very broad at the base, hollowed out near the middle below and near the top above.

Specimens are at hand from Can., N. Y., Va., D. C., Mich., Ky., Ia., Kan., Colo., Mex., and Vancouver's Island, indicating a very wide and general distribution.

Larva: Larvæ very similar to those of *4-punctata*; vertex extending upwards and slightly forward as a transverse carina, not deeply lobed.

Vertex very short, appearing as a transverse carina projecting slightly upwards and forwards, divided by a shallow median excavation into two broadly-rounding lobes. Face very flat, front wedge-shaped with a distinct suture just below the obscure ocelli, very

slightly expanded over the antennal pits. Pronotum broad and short, wing pads long, oblique, abdomen compressed and carinate dorsally as in *4-punctata*, in color reddish-brown, margins of segments and of facial pieces slightly lighter, an oblique fuscous band from base of crest to the venter on third segment and another from the crest of the fourth segment to the venter on sixth.

Life History: Larvæ were found with those of *4-punctata* in January and again in May. They continued to be found for some time after the latter had all issued. The adults were common, both males and females, nearly through July. The larvæ appeared in August, a few weeks later than those of *4-punctata*, with which they were found constantly associated. They become nearly full grown by fall and pass the winter under the leaves and rubbish to pupate in early spring and later appear as adults.

#### AGALLIA TENELLA n. sp.

Similar to *novella* in appearance, elytra longer and more pointed behind, spots on pronotum obscure brownish. Length, 4.25 mm.; width, 1.25 mm.

Vertex similar to *novella* in shape, margin behind eyes narrower, less constricted outwardly, face broad, short, genæ parallel-margined below the eye, then slightly inflated before rounding to the loræ. Front broad and short, width at base nearly equal to length, narrowing nearly uniformly throughout to the clypeus, loræ twice longer than wide, frontal suture obtusely angulate, the apex reaching nearly the level of the ocelli. Pronotum finely granulated much as in *novella*, humeral margins longer, less rounding, elytra long and very narrow, two transverse nerves between the first and second sector, veins on clavus approaching very closely on the middle half.

Color: Light-gray with vertex and scutellum yellow, spots on vertex and pronotum dark. Face light-yellow, sutures dark-brown, inner pair of spots on vertex small, outer pair larger than in *novella*, not as far behind eye, as large as the inner pair. Pronotum light-gray with a median line and two obscure spots near the middle on either side reddish-brown, scutellum yellow with a triangular spot near the basal angle on either side, two spots and a transverse line on the disc black. Elytra smoky sub-hyaline with light nervures and light sutural margins interrupted by a dark saddle between the claval nervures and another at the base of the inner apical cells.

Genitalia: ♀, ultimate ventral segment long, lateral margins parallel, posterior margin produced one-half the length of the segment on the middle, sloping away to the lateral angles, tip slightly but distinctly notched; pygofer stout, two and one-half times the length of the segment, slightly exceeded by the oviducts.

Described from three females, Vera Cruz, Mex. (Osborn). Readily separated from the other two of the section by the genitalia and length of elytra.

Larva: Form similar to that of *novella*, vertex longer, nearly equaling the pronotum in length, reddish-brown with light spots in four longitudinal rows. Vertex widening from eyes obliquely upward and forward in a plane with the face, upper margin acute, roundly lobed. Vertex, front and clypeus forming a concave-margined wedge, thorax much as in *novella*, abdomen with two weak lateral carinæ, reddish brown with a light upper margin to the vertex, four white bristle-bearing tubercles on the posterior margin of each thoracic and abdominal segment.

#### AGALLIA OCULATA V. D.

Ent. Amer., VI., p. 38, 1890.

Species large, stout, much broader than *tenella*, resembling *producta* in form and size but easily distinguished by the central position of the pronotal spots, and the curvature of the vertex. Length, 4.50 mm.; width, 1.50 mm.

Vertex rather broad against the eye, nearly regularly narrowing to the middle, where it is simply a line, posterior margin produced around behind the eye, then slightly expanded and convexly rounding to loræ. Frontal suture slightly curved, front very broad at base, three times width on clypeus, wider than long, sides slightly constricted above the middle. Pronotum long, the posterior margin short, truncate, humeral margin long rounding to the eye, more than half the length of the pronotum within the curve of the vertex. Elytra long convex in front, narrow behind, veins on clavus approaching in the middle.

Color: Fulvous-brown, spots on vertex and pronotum black, nerves of elytra light, interrupted by dark-brown bands, vertex light-fulvous with a median line, two large spots on the disc, a pair of smaller ones against each eye, black; sides of front, tip of clypeus and facial sutures dark-brown. Pronotum fulvous, a large spot near the center of either side, black, a median line, a small spot on either side of it near

the anterior margin, and another small spot on the humeral margin back of either eye dark-brown. Elytra testaceous-brown with light nervures interrupted with dark-brown before the middle.

Genitalia: ♀, ultimate ventral segment nearly twice wider than long, posterior margin slightly curved, pygofer long, stout, four times longer than the ultimate segment, tip of ovipositor exceeding the pygofer, reaching the base of the apical cells.

AGALLIA SANGUINOLENTA, Prov. (Plate I., Fig. 3.)

*Bythoscopus sanguinolenta* Prov. Nat. Can., IV., p. 375, 1872.

*Bythoscopus siccifolius* Uhl. Bulletin U. S. Geol. and Geog. Survey, II., p. 359, 1876.

Small and compact, broader and flatter than any of the preceding species, vertex short and broad, two large dark spots slightly farther from each other than from the eye, pronotum transversely rugulose, short and broad, without distinct spots, elytra sub-hyaline with dark nervures except at the base. Length, 3 mm.; width, 1.50 mm.

Vertex about four times wider than long, over one-third the length of the pronotum, margins broadly rounding, nearly parallel, posterior margin not elevated, touching the pronotum throughout. Face broad, genae very slightly angular. Front, width at base equaling length, slightly narrowing to the middle where it is nearly parallel-margined, roundingly narrowing to the clypeus where it is still very broad, clypeus half longer than broad, sides parallel. Pronotum transversely rugulose except a small area just behind the inside corner of the eye, over twice wider than long, humeral margin long, side margin short but distinct, anterior margin broadly and regularly curved, curve including nearly one half the length of pronotum, scutellum large, triangular, tip long, attenuate, partly concealed beneath the elytra. Elytra broad, convex, scarcely narrowed before the broad apex, a little longer than the abdomen.

Color: Light gray, with a very variable amount of dark fuscous markings. Vertex yellowish with a pair of large round spots slightly farther from each other than from eyes, black, a median line and one next each eye, dark reddish-brown. Face yellow with sutures, six or seven short arcs on each side of the front, and a longitudinal line on the clypeus, reddish-brown. Pronotum light-gray with a series of impressed points back of the anterior margin, a median line enclosing

a narrow light one and two lateral longitudinal lines reddish-fuscous. Elytra with the first sector as far as the first fork and the veins on clavus broadly light, interrupted on the outer claval veins before the tip, remainder of nervures, the claval suture, the internal areas on clavus and a more or less definite saddle extending across the back between the apices of the two claval nervures, brownish-fuscous. The color is subject to great variation but the two round spots on the vertex persist in almost black forms.

Genitalia: ♀, ultimate ventral segment twice wider than long, the posterior margin very slightly sinuate either side of a shallow median notch; pygofers short, broad, scarcely twice longer than width of base. ♂, valve short, truncate; plates broad, half longer than wide, truncate at apex, the bases enclosed by the inflated pygofers whose tips, slightly exceeding the plates, are thickly set with coarse hairs.

This is a widely distributed species. Specimens are at hand from Ont., N. Y., D. C., Ky., Ala., Miss., Ia., Kan., Neb., Wyo., Colo., Arizona, Cal., and Vera Cruz, Mex.

The larvæ somewhat resemble the adult in form; very short and plump, head slightly wider than thorax, wing pads flaring, in the pupæ reaching the fourth abdominal segment, abdomen short, plump, the tip elevated so that the visible part of each segment is narrowest above.

Color: Creamy-white with heavy fuscous spots and bands. Vertex with the two round spots and median band as in adult, the markings next eye heavier. Face with the sutures and a few arcs on the front fuscous as in adult, thorax with a narrow median light line between two broader dark ones that expand on the anterior margin of each segment, an irregular dark blotch behind each eye extending as a band back to the inner angle of the wing pad, then obliquely outward along the inner margin, a pair of narrow wedge-shaped lines between these and the median one on the posterior segment, an oblique line on the wing pad and a marginal line on the outer and posterior margin, brownish-fuscous. Each abdominal segment with a broad brownish dark band on the anterior margin, venter light. Length of pupæ about 2mm.

#### AGALLIA UHLERI V. D.

Can. Ent., XXVI., p. 91, 1894.

Slightly longer and narrower than *sanguinolenta*, the elytra much longer, less convex, light grayish-brown, almost unicolorous above but

for the spots on the vertex and scutellum and the terminal nervures. Length, ♀, 3-3.25 mm.; width, 2.25 mm. or over.

Vertex distinctly broader and shorter than in *sanguinolenta*, the eyes much wider than the pronotum. Face somewhat longer than wide, the genæ scarcely angulate, frontal suture strongly arcuated, indistinct. Front longer than breadth at base, scarcely wider than the clypeus below. Pronotum more than twice wider than long, humeral margin nearly straight, touching eye, posterior margin long. Elytra long and narrow, portion of corium extending beyond tip of clavus being longer than its width at base, apical cells long, central anteapical cell extending posteriorly much farther than adjacent ones.

Color: Pale grayish-brown tinged with yellowish on pronotum and vertex, two sharp round spots on vertex and two triangular ones just inside the basal angle of scutellum projected forward and slightly visible through the semi-transparent pronotum, black, sometimes a transverse line on scutellum and an irregular impressed one back of anterior margin of pronotum, dark brown. Face pale-yellowish, sometimes suffused with reddish-brown, a few pale arcs on the front, ocelli red, basal two-thirds of elytra light-gray with indistinct nervures, apical third subhyaline with distinct dark nerves, usually an interruption on the outer claval nerve and a narrow line margining the light sutural line, fuscous.

Genitalia: ♀, ultimate ventral segment as long as breadth at base, very slightly narrowed posteriorly, the posterior margin with a deep roundingly triangular notch reaching over one-third the distance to the base, pygofer short and stout, scarcely exceeding the apex of the clavus; ♂ valve short, posterior margin truncate, lateral margin oblique, plates longer than broad, slightly narrowing and cupping to the truncate tip, their base enclosed by the inflated pygofer, which slightly exceed them in length and meet behind in a slight keel.

Specimens are at hand from Wyoming, Colorado, New Mexico, and it was collected at Sioux City, Iowa, from hill-top, July 7th.

Readily separated by the length of the elytra and by the single deep notch in female segment.

AGALLIA GILLETTEI n. sp.

Form narrower and more wedge-shaped than *sanguinolenta*, elytra narrower and longer, pattern of ornamentation similar but less distinct, elytra without transverse bands. Length, ♀, 2.75-3 mm., width, less than 1.25 mm.; ♂ slightly smaller.

Vertex narrower next eye than in *sanguinolenta*, more produced and rounded between the ocelli, face more rounding, genæ scarcely angulate. Front similar to *sanguinolenta*, the basal suture more rounding, pronotum similar to *sanguinolenta*. Elytra longer, less convex, apical cells longer.

Color: Grayish-brown tinged with yellowish. Vertex with two round black spots smaller than in *sanguinolenta*, a broad median line enclosing a narrow light line, an arcuated line on either side arising from a spot at the inner posterior angle of the eye, then curving out to a point near the ocelli, with which it is connected by a short line, then back to the margin of the eye and obliquely down to the frontal suture above the antennæ, reddish-brown, ocelli bright red. Face marked much as in *sanguinolenta*, the frontal suture much more arcuated, less distinct. Pronotum cinereous-brown, an arcuated row of coalescent dots back of the anterior margin, three pairs of more or less distinct dark-brown longitudinal lines, the inner pair enclosing a narrow light line. Elytra, base fuscous with light nerves, remainder hyaline with dark nerves; no indication of transverse bands as in *sanguinolenta*.

Genitalia: ♀, ultimate ventral segment broad, laterally parallel-margined from the base one-half its length, then the surface depressed and the margin roundingly narrowing one-fourth the entire width, posterior margin excavated from the acute lateral angles by three successive steps, the first being strongly oblique, to the bottom of a narrow median notch reaching over half-way to the base of the segment. ♂, valve twice wider than long, anterior and posterior margins parallel, side margin straight, oblique; plates nearly three times the length of the valve, the margins rolled up forming a half cylinder with a diameter slightly greater than the truncate apex of the valve, the ends of the plates convexly folded closing the end; pygofer only appearing from below as a fold around the base of the plates. Suture between the plates broadly dark, towards apex.

Described from numerous examples collected in Arizona by Prof. Gillette, to whom it is dedicated as a slight acknowledgment of the favor extended in placing all of his available material at our disposal.

A very distinct little species, slightly smaller and of more uniformly fuscous than *sanguinolenta*, shorter and darker than *uhleri*. Readily separated from either by the very distinct genitalia of either sex.

## AGALLIA BIGELOVIA Bak.

Psyche, VII., 240, Sup., p. 26, 1896.

Form similar to *sanguinolenta*, but broader, more robust, color pale-grayish, obscurely marked with fuscous, spots on vertex and scutellum large, black. Length, 3 mm., width, 1.50 mm.; ♂ slightly smaller.

Vertex very broad and full, nearly half as long as pronotum, eyes much wider than pronotum. Face broad, genae with a very slight constriction, then almost straight-margined to the clypeus. Front broad above and nearly parallel-margined, rounding below, but much broader than clypeus. Pronotum short and broad, lateral margin obsolete, humeral margin rounding, very oblique, elytra broad, not as strongly convex as in *sanguinolenta*, somewhat exceeding the abdomen. Venation slightly irregular.

Color: Pale yellowish-gray, vertex light, with two large round spots as in *sanguinolenta*, black, sometimes a broad, indistinct median line and a triangular spot next each eye connected with the ocelli by a slender line, reddish-brown, face pale, sutures and frontal arcs indistinctly reddish-brown. Pronotum gray, sometimes with indistinct longitudinal brown bands, scutellum with two black triangles just within the basal angles and extending forward under pronotum. Elytra pale-gray with fuscous nerves on the corium beyond the branching of the first sector, a few narrow fuscous lines on clavus.

Genitalia: ♀, ultimate ventral segment broad and short, posterior margin consisting of two lateral rounding lobes and two intermediate acuminate ones slightly narrower and shorter, their median incision reaching nearly to the base, pygofer broad and short. ♂ valve narrow, not more than half wider than long, margins parallel, disc inflated, convex, plates three times the length of the valve, sub-cylindrical at base, laterally compressed at apex, giving them a long, triangular appearance, pygofer much inflated, enfolding the base of the plates, rapidly narrowing to a point before the apex of the plates.

Lower California, Mexico; Winslow, and Albuquerque, New Mexico.

The original description was from a single female with much shorter elytra than the average. Readily distinguished by its stouter appearance and distinct genitalia.

## AGALLIA CINEREA, n. sp.

Form of a small *sanguinolenta*, the vertex slightly longer and stronger, elytra even shorter and broader, about equaling the abdomen, pale-

yellowish cinereous above with two small points on vertex and sometimes the angles of scutellum black. Length, 2.5 mm., width, 1.25 mm.

Vertex stout and broad, one-half the length of the pronotum, slightly inflated in the middle, the posterior margin touching the pronotum. Face convex, moderately broad, the outer angle of the genæ obscure, frontal suture strongly rounding. Front broad, roundingly narrowing, much broader than clypeus, clypeus narrow, parallel-margined, loræ more than twice longer than wide, longer than clypeus. Pronotum coarsely transversely rugose posteriorly, finely granulated just behind the eye, much narrower than eyes, more than twice wider than long, anterior margin broadly rounding, including two-thirds of the length, humeral margin very oblique attaining eyes, posterior margin short, roundingly emarginate. Elytra short, slightly exceeding abdomen, the venation weak, apical cells short, the second often not separated from the first anteapical, forming a long, narrow, slightly curved cell.

Color: Pale cinereous, much paler than in *uhleri*. Vertex touched with yellowish, two small round dots slightly farther from each other than from the eyes, black. Face pale creamy-yellow above with dark red ocelli, reddish below. Pronotum pale cinereous, unmarked. Elytra pale, sub-hyaline gray with light indistinct nervures.

Genitalia: ♀, ultimate ventral segment short and broad, shorter than in *sanguinolenta*, posterior margin slightly rounding with a faint median notch; ♂, valve very short and broad, posterior margin rounding, often nearly concealed under the ultimate segment, plates nearly twice longer than broad, roundingly narrowing to the truncate dark-tipped apex.

Described from numerous examples from Iowa and Colorado.

The Iowa examples were taken at Little Rock and Sioux City in July, from high gravelly points where plants characteristic of the plain region, such as *Bouteloua* and *Artemisia*s predominated and from which several other species of western Hemiptera were taken. The Colorado specimens were received through the kindness of Prof. Gillette.

Larva: Form of the larvæ of *sanguinolenta* nearly, head somewhat stronger, the dark bands almost wanting. Head broad, somewhat inflated, eyes wider than thorax, thorax narrow, the wing pads shorter, abdomen slightly carinate and curved upwards; color, creamy-white, two distinct spots on vertex as in adult. Face pale-reddish, pronotum light, a single oblique line on either wing pad, abdomen paler, not banded. Length scarcely 2 mm.

## AGALLIA PEREGRINANS Stal.

*Bythoscopus peregrinans* Stal. Freg. Eugenes. Resa. Ins., p. 291, 1859.  
Berg Hemipt. Argent., p. 276, 1879.

*Agallia peregrinans* Berg. Addend. et Emend ad. Hemip. Arg., p. 176, 1884.

While this species seems quite certainly to be an *Agallia*, especially from the description of Berg, lack of access to the original description of Stal leaves some doubt as to the specific determination. A species represented in our material by a number of examples from Southern California and Palo Alto, Cal., should probably be referred here and they would fall under the third division of the synopsis next to *sanguinolenta*, from which they may be separated by the larger size, longer elytra, and female segment and the tubular plates in the male.

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DESCRIPTIONS OF EARLY STAGES AND NEW SPECIES  
OF BYTHOSCOPIDÆ.

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MACROPSIS APICALIS n. sp. (Plate II., Fig. 1.)

Form of *robustus* nearly, somewhat larger, elytra longer; green, the elytra sub-hyaline with green pubescence, infuscate at the apex. Length, ♀, 5 mm.; ♂, 4.5 mm.; width, ♀, 1.8 mm.; ♂, 1.3 mm.

Vertex over three times wider than long, as long as the eye, margins parallel, slightly curved, anterior margin rounding to the face, face half wider than long, front tumid, clypeus and genæ flat. Pronotum large, two and one-half times the length of the vertex, twice wider than long, side margins very long, carinate, surface with fine but distinct transverse striations, scutellum large, transversely striate, elytra full three times longer than wide, margins nearly parallel, less convex than in *robustus*, clavus with the apex obliquely truncate, inner apical cell wanting, confluent with the broad appendix, the marginal nerve becoming obsolete not far from the base, fourth apical cell narrow at the apex, next two short, broad behind, three anteaapical cells, the outer one smallest, whole surface of elytra except the broad appendix clothed with short, remote hairs.

Color: Bright-green, pronotum shiny, elytra appearing lighter from the reflection of the light-green hairs, the apex of clavus, tip of

second sector, the line separating the appendix from corium, and a spot on the margin of each apical cell, black; legs and below, deep-green, tarsi blackish at the tip.

Genitalia; ♀, ultimate segment twice wider than long, rounding, or slightly produced with a slight notch; ♂, valve long, parallel margined, rounding behind, angularly elevated along the median line.

Described from numerous examples collected from the honey locust at Ames and Sioux City, Iowa, and one from West Point, Neb.

Larvæ: Similar in form to the adult, very noticeable for their large pronotum and the entire dorsal surface being covered with stout hairs, bright-green, those on more exposed situations, brownish.

This is a common species on the honey locust wherever it has been examined, but has never been found elsewhere. There are two broods in a year, the adults appearing in June and again in September. It is intermediate in size between *robustus* and *laeta*, but differing from both in venation and in the elytral hair being light-green.

**BYTHOSCOPUS DISTINCTUS V. D. (Plate II., Fig. 2.)**

General form similar to the preceding, about one-third smaller, head green, reduced to a curved line bordering the rounding pronotum, narrower than the dark-brown eyes. Pronotum greenish, coarsely pitted with black, darker behind the eyes, scutellum triangular, green, with the corners black, wings with a broad band at base, the tip and a narrow band before it black; in light specimens the whole wing is of a grayish slate except for a black spot in place of the middle band.

Larvæ: Stout green forms with thicker, blunter heads than the adults, nearly straight-margined, with a few long hairs projecting forward, body large, plump, abdomen ridged above, the sides with a flap-like margin which fits around the sides of the leaf-stem, or twig upon which the insect rests.

This species occurs in abundance on black walnut and butternut and adults have been found on hickory and hackberry, but only where they were adjacent to the first-named trees. Full-grown larvæ and freshly-issued adults were found the second week in June; a few days later the larvæ had all issued, the adults remaining abundant until into July. The second brood of larvæ appeared before the middle of August, the adults again in the latter part of September, to hibernate and deposit eggs in the spring.

## PEDIOPSIS TRISTIS V. D. (Plate II., fig. 3.)

This is a large, narrow, grayish-brown species from one-fifth to one-fourth of an inch long. The head from above appears only as a light line from the eyes around the angular point of the pronotum. The pronotum has a narrow light margin behind and is covered with fine light hairs, the wings are slightly transparent, setting off the dark-margined raised veins. Easily recognized by the face below being light-greenish with a large black spot in the middle below the eyes and a band on the margin above.

The larvæ are very similar in form to those of *B. distinctus*, but the abdomen is not as strongly ridged and the head is broader. They are reddish-brown above, marked with whitish on some of the sutures, and with four dark-margined light spots in the form of a square on the body. The whole surface is covered with fine white hairs, giving a light reflection. The face is light with a large black spot as in the adult.

The species seems to be strictly confined to plum trees, to which it is admirably adapted in color. They were found to occur most abundantly on the native plums but have been taken from cultivated varieties.

The larvæ appear in May and have all issued as adults by the end of June. The first adults appear about the third week in June and are found abundantly throughout July, disappearing before the middle of August.

## PEDIOPSIS FERRUGINOIDES V. D. (Plate II., Fig. 4.)

This is a very pretty rusty-red species a little larger than *viridis*, being nearly one-fourth of an inch long (5 mm.); the females vary from reddish-orange all over except for a large transparent spot before the end of the wings to dark reddish-brown; in this case the light spot extends clear across the wings, dividing the dark up into two parts.

The larvæ are yellow and brown in general imitation of the adult, the head and pronotum yellow, the rest of the body brown with a transverse band across the back of the wing pads and another across the abdomen.

They occur on the narrow-leaved willows, very commonly. The larvæ were found early in June, from which the males began to issue late in the month and the females by the first of July. The males soon after disappeared, the females remaining through the month.

## PEDIOPSIS SUTURALIS n. sp.

Form of *ferruginoides* nearly, bright-green with the the entire claval areas black, approaching *basalis* in size and ornamentation, but with a much more produced vertex. Length of ♀, 6 mm.; width, 1.75 mm. ♂ smaller.

Vertex little more than half the length of the eye, forming nearly a right angle in front, the center of the eye behind the middle of the vertex; front very flat, acutely angled above; pronotum finely wrinkled, nearly twice longer on middle than across the humeral angle to the eye, posterior margin shallowly emarginate, elytra long, roundingly angled behind.

Color: Bright green on face, pronotum and scutellum, a black stripe arising just back of either eye, widening backwards to the humeral angle, usually leaving a small green spot on the outer angle of the pronotum next the eye, the entire claval area of the elytra deep black, sharply and definitely bounded by the claval suture until just before the apex of clavus, when it crosses the suture and extends as a gradually narrowing stripe around to the tip of the wing, corium greenish on basal portion, hyaline beyond. Eyes reddish, propleura unmarked.

Described from one male and seven females from Ames, Iowa, and one female from the Van Duzee Collection (Colden, N. Y.)

Larvæ similar in form to those of *ferruginoides*, head very broad, transverse or slightly rounding; eyes prominent, thorax stout, convex; abdomen short, broad, dorsally carinate.

Color, green, a black stripe arising behind either eye as in the adult, but running back across the wing pads and along the abdomen just within the margin, widest near the end of the wing pads, where it curves out and becomes narrower on the abdomen.

The larvæ appear on willows about the first of June and even then show the unmistakable black line; adults from the first of July on into August.

Readily distinguished from other described species by its black dorsal shield. It might be mistaken for *basalis*, with the basal mark elongated, but for its sharp vertex.

## PEDIOPSIS GLEDITSCHIÆ n. sp.

Form and color of *viridis* nearly, about one-third smaller, with a slightly shorter, rounder vertex, approaching *reversalis* in size but much

darker green, propleura unmarked in either sex. Length, ♀ 4.5-5 mm.; width, 1.25 mm.; ♂ slightly smaller, darker.

Head compact, eyes small, a line across their centers cutting off less than one-third of the pronotum, vertex slightly, roundingly, obtusely angled, distinctly shorter than in *viridis*. Pronotum very finely granulated, posterior margin angularly excavated, disc strongly convex, depressed within and behind either eye, elytra moderately long, broadly and evenly rounded behind.

Color: Females, bright-green, the elytra hyaline at the tip; males, the head and pronotum green, the elytra clouded with brownish or dark fuscous, the costal margin green, scutellum yellowish or clouded with fuscous in the darker examples. Below, green in both sexes, the propleura without a black spot in either sex.

Described from numerous examples.

Larvæ very similar to *viridis*, short and stout, with transverse heads, thorax convex, shiny, abdomen broad, crested, each segment of the crest elevated into a flat curved tooth projecting backward and tipped with a hair; color, bright green.

Found exclusively on the honey locust along with *Macropsis*, the larvæ appearing in May and maturing before the middle of June, the adults throughout June and the first half of July. They are found at the base along the sides of the leaf stalks. This species might easily be confused with *viridis*, but the female is only as large as the *viridis* male while the males are still smaller and lack the spot on the propleura. Deeply-colored males have the elytra almost black instead of brown, as in *viridis*. These characters, along with the very distinct and constant difference in food plant and life history, leave no question as to specific identity.

PEDIOPSIS CROCEA n. sp., (*glereditschiae* ? var.)

Form of *basalis* nearly, smaller, with short, stout elytra which are scarcely longer than the abdomen and are inclined to be flaring behind as in *tristis*; bright saffron yellow, the elytra clouded with brown. Length, ♀ 5 mm.; width, 1.5 mm.; males smaller.

Head short, depressed, the pronotum very much elevated behind, the anterior margin depressed, obtusely angled before, the rugæ coarse and distinct, a median raised line. Scutellum very coarsely rugose, a triangular spot in each basal angle shagreened. Elytra strong, nervures distinct, lighter.

Color: Face and pronotum bright saffron-yellow, scutellum light-yellow, sometimes with the basal angles clouded. Elytra clouded with brown, deepest on the claval areas and fading out to light-yellow before reaching the costal margin, sutural and humeral margins with a narrow saffron-yellow line. Below, light-yellow, claws brown, propleura unmarked. In two examples the elytra are scarcely clouded, being light-hyaline yellowish throughout.

Described from eight females and five males collected on honey locust at Lexington, Ky., by H. Garman.

Its occurrence on this food plant suggests identity with the preceding species, but aside from the striking and apparently constant difference in color (which might possibly be referred to fading or variability) there seems to be some differences in form of head and other details which, if in any degree constant, would be of specific value.

#### PEDIOPSIS REVERSALIS n. sp.

Allied to *punctifrons* but larger, in size intermediate between that species and *gleditschiae*. Light-green, the male with two broad, black stripes across the face, tips of the legs, and a spot on the propleura black. Length, ♀ 4.50 mm.; ♂ 4 mm.; width, about 1.25 mm.

Head short, stout, more obtusely angled than in *gleditschiae*, a line across the eyes scarcely cutting off a third of the vertex, vertex with much finer striations than in *punctifrons*, less excavated behind, the disc equally convex, but not as strongly pitted in front. Elytra moderately strong, venation regular, not strongly marked.

Color: Light-green, pronotum and face washed with yellow in the female, male with a broad black band along the upper margin of the face extending down to the middle of the front in a triangular point; below this, between the lower margins of the eyes, is a still broader black band, propleura with a round black spot, tips of the anterior pairs of tibiæ and tarsi annulate with black. In some of the males the band on the face is reduced to three black spots, one on the apex above and one just within and below each ocellus. The females are entirely unmarked except that in some cases the propleura has a faint spot.

Described from twenty-four males and twenty-four females collected from willows at Ames, Iowa, from the middle of June until into August, and three males from the Van Duzee collection from Colden, N. Y.

This is the second American species of the spotted-face group so common in Europe, and represents the section in which the nerves are concolorous with the elytra, while *punctifrons* represents the colored nerved section. The spots on the male face are very variable, sometimes covering half the surface and again nearly wanting. The three males from New York are of this type, the spot on the propleura also wanting, as it is in a few of those from Iowa. A damaged female from Denver, Colo., is also apparently of this species.

IDIOCERUS ALTERNATUS Fitch. (Plate II., Fig. 1.)

This common species is slightly over one-fifth of an inch long with a broad head curving around the pronotum. The middle bears a large reddish-brown blotch, just outside of which, on top, there are two small black spots on a yellow band that extends to the eyes. The pronotum is reddish-brown and usually there is a white stripe down the middle. The wings are partly transparent, the veins being dark in some places and light in others, alternating, a light spot near the center of the median line.

The eggs are about one mm. long by about one fifth of a mm. wide, cylindrical, slightly curved, tapering gradually to a point at one side of the smaller end and cut off obliquely to an obtuse point on the opposite side at the large end. They are deposited in the young wood, near the tip of a branch, usually close to a bud, sometimes singly, more often three or four near each other. In either case the twig would enlarge at the spot and finally burst open and show the end of the egg in the seam. If many eggs were deposited in a twig, as was the case in the cage experiments, it usually died, while if only a few were deposited in a place, as was the case in the field, it sometimes continued to grow, though weak and distorted. The final result on the trees under observation was that over one third of the branches had their tips killed back or distorted, usually the main stem and larger branches being worst affected, probably owing to their more rapid growth in the spring, offering a more favorable place for deposition than the slow-growing side branches.

The larvae are brownish with light rings or greenish with dark ones according to the amount of exposure of their position, in either case closely imitating the bark upon which they rest. The dark rings are made up of about twelve hair-bearing spots on the hind margin of each segment.

**Life History:** The adults pass the winter under the leaves and rubbish in the woods, becoming active quite early in the spring. Some eggs were deposited before the middle of May and from then on nearly through the month. The first larvæ were found the last week in May, when a number hatched in the cases and a few were found in the field, the majority not appearing until in June, the egg stage lasting nearly three weeks in the breeding cage where the temperature was fairly constant, probably a little longer under the changeable spring weather out-of-doors. The larvæ burst through the projecting top of the egg and are quite active from the start. When first hatched they are nearly white except for their red eyes; the head is nearly twice the breadth of the body. Within a few days they become greenish in color and their body is much larger proportionately. The larvæ are abundant throughout June and well into July, the adults beginning to issue the first week, and from then on through the month, remaining abundant through August. The second brood was not as closely watched. The larvæ appeared early in September and the adults soon after, remaining abundant until cold weather sent them under cover.

**IDIOCERUS MONILIFERÆ n. sp. (Plate III., Fig. 2.)**

Form of *brunneus* nearly, more slender behind, resembling *alternatus* in appearance but lacking the fulvous shade and the dorsal white mark. Length, 5.50 mm.; width across eyes, 2 mm.

Vertex broad, shorter than the eyes; face convex; front less produced than in *brunneus*; narrow below; clypeus small at the base, much broadened on the truncate or slightly concave apex; genæ narrow, the margins concave, slightly reflexed below. Pronotum broad, disc nearly flat, humeral margin short, nearly straight, anterior margin broadly rounded. Elytra rather long, venation as in *alternatus*, outer anteaapical cell long, parallel-margined, appendix broad, closely folded posteriorly when at rest.

**Color:** Vertex yellow, brownish fuscous between the usual black spots which are rather small, a median light line broadest at the base; face yellow, black above, omitting a yellow spot just outside the ocelli, and another above the antennæ; front yellow with a brownish circle above connected with an oval below; pronotum nearly irrorate with brownish fuscous on the disc, margins and a broad median stripe light; scutellum yellow, a spot within the basal angle black, a narrow median line forking at the suture, and two spots on the disc reddish-

brown; elytra subhyaline, the nervures alternately black and white, white at base, an oblique black band across the center of the claval nervures and extending to the center of the costa, another from the apex of the clavus behind the nervures transversely to the center of the costa, apical nervures reddish-brown, the cross nervures between the first and second nervures broadly white.

Genitalia: ♀ ultimate ventral segment very short on lateral margins, roundly produced and shallowly notched, pygofer short and inflated: ♂ valve broad, with a median acute tooth and sharp lateral angles.

Described from four females and one male. Larvæ and adults taken from cottonwood in July.

This species is very distinct and at once readily separated from other described species by the position of the white markings on the elytral nerves.

IDIOCERUS BRUNNEUS n. sp. (Plate III., Fig. 3.)

Form of *lachrymalis* nearly, but smaller, resembling the European *I. scurra* in form and color, but smaller and wanting the outer anteapical cell to the elytra. Cinnamon-brown with two black spots on the vertex. Length, 5.5 mm.; width across the eyes, 2 mm.

Vertex very broad and stout, eyes much more prominent than in *alternatus*, nearly half their width beyond the margin of the pronotum. Face very broad and short, front broad and very convex in both diameters, the outer margin of the genae concave, clypeus one-third longer than broad. Pronotum rather short, elytra broad, the appendix narrow, only slightly overlapping behind. Venation distinct, the nerves strong, thickly set with minute tubercles, outer anteapical cell wanting, the outer branch of the outer fork of the first sector curving away to the costa immediately, or at most forming a small triangular cell in the fork.

Color: Dull cinnamon-brown. Vertex and face tawny-yellow, a pair of black spots on the vertex and an olive brown area between them and extending nearly down to the dark ocelli, pronotum olive-brown, testaceous on the depressed spots behind the eyes, scutellum cinnamon-brown in the female, yellowish with three triangles on the base and two spots on the disc black in the male. Elytra brownish sub-hyaline, nervures brown, dark at apex.

Described from numerous examples.

Larvæ very distinct, yellowish and reddish-brown, forms with stout bodies and broad roundingly transverse heads, the whole upper surface clothed with long coarse hairs. The abdomen is rather broad for this genus and there are about twelve hair-bearing tubercles in a row near the posterior margin of each segment.

Color: Head yellow, brownish in front; pronotum yellow, behind which there is a brown cloud and the margins of the abdomen are brown, broadest in the middle, the disc yellow.

Genitalia: ♀, ultimate segment about half longer than the penultimate, posterior margin broadly roundingly produced on the middle half, with an obtuse median notch, pygofer short, less than half longer than their width at base. ♂, valve long, posterior margin produced in an acute median tooth, plates short, stout, curved upward.

The cinnamon color and the simpler elytral venation render this a very distinct species in our fauna. It occurs abundantly on willows at Ames, and has been received from Nebraska. There are two broods in a season, one in July and the other in September, the latter hibernating and depositing eggs in the spring, which hatch out by the first of June.

**IDIOCERUS MACULIPENNIS** Fitch. (Plate II., Fig. 4.)

This is a very bright chestnut-brown species with light markings; the head is very short and the eyes curve around the pronotum and do not stand out as in the willow species. The face is light-yellow with a red stripe down the middle and two large black spots on the side above. There is a light spot on the pronotum, a v-shaped mark on the scutellum and another of the same color on the wings; the outer margins of the wings are very dark except for a white patch before the tip.

The larvæ are dark reddish-brown, sometimes blackish in color with broad, blunt heads and prominent eyes. They are very active and though readily seen, are very difficult to capture, dodging around a limb whenever approached.

They occur very commonly on hawthorn and crab apple trees, the larvæ appearing in May. The earlier ones mature by the middle of June and the last early in July; the adults common the latter half of June and nearly through July. The adults were again common the last of August and early in September.

NEW SPECIES, DIMORPHIC FORMS AND EARLY STAGES  
OF JASSIDÆ.

## DORYCEPHALUS VANDUZEI n. sp. (Plate VI., Fig. 2.)

Remarkably long and slender, ten times longer than wide, pale yellow with a greenish reflection. Form nearly of *D. baeri* but much longer, as long as *D. platyrhynchus* but much narrower, elytra much shorter than in either species. Length, 13-14 mm.; width, 1.25 mm.

*Brachypterous form*: Female, head long, foliaceous, three and one-half times the length of pronotum, nearly as wide as across eyes, very slightly narrowing before the obtusely rounding apex, apex very slightly elevated, a distinct median carina and a lesser one slightly nearer this than the eye on either side, the latter fading out anteriorly, ocelli on the margin before the eye. Front very broad and inflated on the clypeus, broadening to a point before the eyes, then narrowing slowly to near the apex of head, convexly inflated, obliquely ribbed, and thickly beset with coarse hairs on the sides; broadly, concavely, longitudinally depressed in the middle as in *baeri*. Clypeus broad, hairy, slightly longer than wide; genæ, broad at base below eye, then excavated to the lateral angles, which are almost rectangular. Pronotum one-half wider than long, two parallel longitudinal depressions near the middle, lateral margin parallel, carinated, anterior margin broadly shallowly emarginate, the lateral angles obliquely cut off against eye, posterior margin rather deeply angularly emarginate. Elytra short, reaching only to the base of the third abdominal segment, broad at the base, rapidly narrowing to the roundingly divergent apices, venation simple, claval veins united posteriorly, second sector forked near base, first sector forked near apex, apical cells small, irregular; abdomen long, broader than pronotum near base, tapering to the long attenuate pygofers; legs small, inconspicuous, fore and middle femora much dilated near base, their width equalling more than half their length.

Color: Pale straw-yellow with an iridescent greenish tinge especially noticeable on the vertex, a small black spot on the vertex just inside the reddish eye on either side, another on the middle of the posterior margin and a fourth on the median carina a little over one-third the distance to the apex, a small spot near apex of scutellum, four black spots on each abdominal segment arranged in two dorsal

rows, another larger lateral one on the base of each segment on either side, forming a lateral row.

Genitalia: Ultimate ventral segment long, convex, the posterior margin very slightly produced on the middle half, pygofera remarkably long, extending beyond and entirely concealing the ovipositor, their acute tips compressed above, slightly divergent below, and fringed with fine hairs.

Described from two females collected at Little Rock, Iowa, July 1, 1897.

The genus *Dorycephalus* was founded on two female examples described as *D. baeri* from Southeastern Russia, and up to the present time the male has not been described. The only other species of the genus so far described, and the only one of which the life history or the male is known, is *D. platyrhynchus*. The examples of *D. vanduzeei* were swept from high prairie land where the only grass with a stem apparently large enough to support them was *Sporobolus cuspidatus*. If the life history is similar to that of *D. platyrhynchus* these were the last of a brood, the males having all disappeared some time before. From our knowledge of the latter species it may be inferred that the males will be smaller, dark-colored and with a shorter head, long elytra and fully developed wings, and that there will also be a macroppterous form of the female occurring in limited numbers and soon disappearing, while the brachypterous form, which is still clumsier than that of the *D. platyrhynchus*, probably rarely leaves the original host plant.

#### DELTOCEPHALUS IMPUTANS n. sp.

Form very similar to *albidus* or *reflexus*, vertex as long and even more sharply margined than in *reflexus*, creamy-yellow above with two small spots on the tip of the vertex and four dashes margining the reflexed veinlets, black. Length, ♀, 4mm.; ♂, 3.50 mm.

Vertex nearly half longer than wide, twice longer than against eye, acutely angled, disc flat or slightly depressed, margins sharp, tip thickened, slightly elevated, a slight transverse furrow just behind ocelli on the upper edge of the margin nearly one-fifth the distance from the eye to the tip. Front, similar to *albidus*, less than twice wider above than on clypeus, side margins nearly straight and continuous with those of clypeus, genae rounding or but slightly angled. Pronotum two and one-fifth times wider than long, curvature of front margin, about half its length, posterior margin shallowly emarginate,

the lateral margins short and oblique. Elytra short, slightly coriaceous, equaling the abdomen in length, flaring, appendix wanting, never overlapping at rest, usually parted by the elevated tip of the abdomen. Venation similar to *reflexus* on the corium, the two outer veinlets strongly reflexed to the costa, the third at nearly right angles and with the base of the apical cells forming a line across to the apex of clavus, outer antepical cell small, pointed behind, sometimes wanting, the second cross nervure frequently wanting, veins on clavus nearly parallel, without cross nervures.

Color: Above, creamy-yellow tinged with olive. Vertex with the median black line extending nearly to the tip, a spot on either side of the white tip and a faint narrow line on the margin between these and the red ocelli, black, eyes reddish-brown. The three reflexed veinlets broadly white, margined in front with black which also extends along the costa the same distance before them, third apical with its outer margin broadly black. Below, face black, sometimes with a light spot on the apex of front sending off a narrow line curving around the loræ to the angles of the genæ; legs, femora black except tip, tibiæ and tarsi yellow, spotted or annulated with black, tergum and venter more or less infuscated.

Genitalia: ♀, ultimate ventral segment half longer than penultimate, two and one-half times wider than long, narrowing posteriorly to the slightly acute lateral angles, posterior margin, emarginate next the angles, broadly produced in the middle with an acute notch and a black spot either side, pygofer broad at base, constricted before the tip, their sides armed with stout spines. ♂, valve triangular, over twice longer than ultimate segment, nearly as long as broad, constricted near the base and again just before the produced apex, black, narrowly margined with light, plates narrower at base than valve, elongate, twice the length of valve gradually narrowing to the divergent rounding tips which are nearly half the basal width, pygofer inflated at base, flatly compressed at the apex and extending considerably beyond the plates.

Described from thirty-two examples collected at Ames, Iowa.

Larvæ, very similar to those of *reflexus*, lighter and less distinctly marked, light-brown with three stripes and the margins white, upper half of face dark, vertex twice longer in the middle than next the eye, acutely angled, disc flattened, body long, tapering to an acute point.

Color: A median stripe from the tip of the vertex to the tip of the abdomen, widening behind, a stripe on either side margining the eyes

and extending back to the penultimate segment of the abdomen, and the broad lateral margins from the eyes back, white, the outer brown stripe on the abdomen is the darker and bears a row of hair-bearing white spots, one on each segment. Below white; eyes, the upper half of the face, a row of spots along the connexivum and spots against the spines on the hind tibiæ black.

**Life History:** A few adults were taken in July, no more being found until the larvæ which were found in August issued in September. From this it is probable they are two-brooded, adults issuing in June and again in August, the ones taken in July being the last of the spring brood. Larvæ and adults were both found exclusively on a *Muhlenbergia* probably *glomerata* growing in a sheltered but not shaded situation.

Readily separated from any other of the reflexed-vein group by its yellow color and absence of markings above, as well as by the genitalia. Its place is evidently between *reflexus* and *producta* Walk., (given as *bilineata* in the Synopsis) as in the latter species the second cross nervure is often wanting, in which case the venation is almost identical with *Scaphoideus*, and although these are unquestionably good *Deltocephalus* species it would seem to indicate a closer relationship for these genera than has been given heretofore.

#### DELTOCEPHALUS CRUCIATUS n. sp.

Form of *signatifrons* nearly, but smaller, smaller than *weedi*, light-grayish with brown and white markings on vertex, forming a white cross on a brown field. Length, 2.75–3 mm.; width, 1 mm.

Vertex flat, width at base and length equal, two-thirds longer on middle than next the eye, apex nearly rectangular, margin either side nearly straight. Face longer than wide; front broad, wedge-shaped, twice longer than clypeus, less than twice wider above than below, clypeus large, margins continuous with those of front, genæ roundingly angled, broadly margining the loræ below. Pronotum less than half wider than long, equaling the vertex in length, anterior margin broadly curved, posterior margin nearly straight, humeral margins rounding nearly to the eye, elytra moderately long and narrow, equaling or exceeding the abdomen, with an appendix, venation nearly as in *signatifrons*, outer claval vein with a cross nervure to the suture near the base, central antepical cell elongate, constricted, but not divided, outer antepical small or wanting.

Color: Vertex with brown spots leaving a light-yellowish marking as follows: A broad line on the anterior margin and extending back along the eye, a median light stripe broadest at the base, near which it gives off two branches which curve away to the middle of the eye; midway between these and the apex are two short projections at right angles, forming a Greek cross in white on a dark brown field. Front brown with light arcs, rest of the face light-yellowish with brown sutures. Pronotum yellowish-olive, irregularly marked with brown on the anterior half; sometimes four light olive stripes are evident. Scutellum yellow with black markings on the disc and inside the basal angles; elytra subhyaline, the nervures broadly white, margined inside the cells with fuscous except along the basal part of the costa; tergum black, margins yellow, below brownish.

Genitalia: ♀, ultimate ventral segment twice wider than long, anterior and posterior margin parallel, pygofer stout, moderately long, brown, with small white spots, each bearing a slender bristle: ♂, valve broad and short, rounding behind, plates broad at base, wedge-shaped to the truncate tips where they are one-third as wide as at the base, side margin straight, thickened, clothed with coarse white hairs.

Described from thirty-two specimens, Little Rock, and Ames, Iowa.

This species will fall in the second group of *Deltocephali* with *signatifrons* which it will follow; the outer antecapital cell is elliptical as in that species but smaller, sometimes wanting. It may be readily separated from *signatifrons* by the absence of the tooth on the female segment and the wedge-shaped plates of the male.

#### DELTOCEPHALUS OBTECTUS n. sp.

Form and ornamentation of *D. weedi* nearly, lighter in color, vertex more produced, longer and narrower than *D. compactus*. Length 3-3.5 mm. Width 1-1.25 mm.

Vertex convex, point much produced, anterior margin strongly concave either side of apex, side margins oblique, length on middle equalling width at base. Face, width and length about equal. Front large, side margins convex, clypeal suture distinct, straight, half as long as width of front, clypeus broad, sides straight, genae emarginate below eyes, outer angle strong but rounding. Pronotum as long as the vertex, twice wider than long, humeral margin strongly oblique, side margin short, anterior margin much produced between the large straight-margined eyes. Elytra exceeding the abdomen in length,

rather narrow. Venation nearly as in *weedi*; inner claval nervure strongly arcuated, joined to the outer nervure by two cross-veins, one at the middle and another at the tip, a number of transverse veins between the outer claval nervure and the suture, central anteaapical cell long, constricted in the middle and divided by a broad transverse vein, a number of irregular veins along the costa.

Color: Light grayish, maculate, with a broad interrupted crescent across the middle of the vertex and several spots on the anterior margin of the pronotum black. Vertex light-yellow, a transverse interrupted crescent across the middle of the disc, a narrow line extending back from the point of interruption on either side of a median impressed line, black, a pair of rectangular spots just inside the ocelli before the crescent, another longer pair just back of the produced white-tipped apex and a curved line on the margin either side of the apex, dark reddish-brown, a large irregular circle back of the crescent on either side brownish, ocelli red, broadly margined with white, eyes dark, their inner margin reddish. Face, brownish olive, with the suture darker and lighter arcs on the front. Pronotum grayish olive with an irregular black mark from behind either eye running towards the disc, and a concave row of points between the inner angles of the eyes black, scutellum light yellowish, a black spot just inside either basal angle and usually some markings on the disc, black. Elytra light, nervures broadly white, cells margined with fuscous, which is usually emphasized on the middle of the clavus, just inside the middle of the corium, and in three spots on the costal margin. Below, light in female, dark in the male, legs light, anterior femora annulate with black.

Genitalia: ♀ ultimate ventral segment, with an additional membrane as in *compactus* the outer one, half as long as its width at the base, the side margins rounding to the nearly truncate apex and disclosing the outer corners of the second membrane apex elevated over the base of the ovipositor and usually marked with dark: ♂, valve large, triangular; plates small, about twice the length of the valve, broad at the base, rapidly roundly narrowing to the produced attenuate points, margin with a few long light bristles; pygofer longer, the plates acuminate at the apex, densely clothed with coarse bristles.

Described from numerous specimens.

This neat little species is closely related to *weedi* and *compactus* and would fall between them in the synopsis. It may be readily separated from either by the absence of the reddish-brown color so characteris-

tic of those species. In color it approaches *cinereus*, but is quite distinct structurally. The genitalia are quite distinctive and will readily separate it from either of the above named species.

DELTOCEPHALUS COLLINUS Dahlb.

Form of *melsheimeri*, nearly related to *D. monticola* but larger, larger than *melsheimeri*. Length, ♂, 3.3 mm.; ♀, 4 mm.; width, 1 mm.

*Brachypterous form:* Vertex flat, obtusely angled before, width and length about equal, slightly more than half longer against eye than on middle, anterior margin concave between the ocelli and the tip, the outline, however, obscured by the rounding front, front transversely convex, twice wider above than on clypeus, one-third longer than wide, clypeus half longer than wide, genæ scarcely angled below the eyes, broadly margining the loræ below and attaining the apex of the clypeus, pronotum two and one-half times wider than long, shorter than vertex, anterior margin broadly rounding, posterior margin shallowly emarginate, side margin short, not carinate. Elytra narrow, shorter than abdomen, the tips divergent from the apex of the clavus, reaching to the base of the penultimate segment, venation irregular, the apical cells minute or wanting, the two inner anteapicals large, outer very small or wanting. Wings proper, rudimentary.

*Color:* Green, with brown eyes and a grayish-olive vertex, vertex with a light median stripe enclosing the usual dark impressed line, a light stripe next each eye and a short one on the middle of face on either side, face olive-brown with dark sutures and light arcs, tip of rostrum black, anterior margin of pronotum light-green, posterior portion of disc darker, sometimes longitudinally striped with fuscous, elytra green, nervures lighter, tip hyaline, posterior margin of abdominal segments light green, disc green with slight fuscous markings, under side with a silvery sheen, disc of abdominal segments black, sometimes a median light line.

*Macropterous form:* Structural characters as in the preceding form, except that the side margins of the pronotum are shortened, allowing more freedom to the elytra. Elytra long, narrow, reaching the tips of the pygofer, margins nearly parallel, the tips obliquely rounding and slightly reflexed, giving the insect a linear aspect. Venation distinct, slightly irregular, discoidal cell formed by the branching of the first sector, long and narrow, outer anteapical cell very small, oval, apical cells large, the second one long, wedge-shaped, curved, usually a few

irregular nervures running to the costa from the first sector, under wings as long as elytra, folded.

Genitalia: ♀, ultimate ventral segment twice wider than long, longest on the rounding lateral lobes, middle half of the posterior margin roundingly emarginate, with a median roundingly triangular tooth, emarginate portion four times the width of the base of the tooth, tooth and lateral lobes light, lateral margins of emargination sharply black, pygofer long, slightly exceeding the ovipositor, thickly beset with stiff bristles: ♂, valve triangular, twice wider than long, plates convexly widening from the base, then concavely narrowing to the obtuse, obliquely divergent apices; pygofer long, compressed, extending beyond the plates, their tips and sides studded with strong spines.

Described from numerous specimens swept from *Sporobolus* at Little Rock and Sioux City, Iowa, July 1-7, among which were six macropterous females. One macropterous female was received from Prof. Gillette and another is in the V. D. collection, both from Colorado.

The brachypterous form can not be confounded with any other described North American species. The macropterous form superficially resembles *melzheimeri* but may be readily separated by the genitalia, the extreme length of the abdomen or by the strikingly parallel appearance of the costal margins of the elytra. Though not agreeing in every respect with Fieber's drawings, yet on comparison of our specimens with European examples from Dr. Melichar it was found that no such differences existed, and it would seem that Fieber's drawings were not exact.

#### DELTOCEPHALUS OBESUS n. sp.

Form and appearance of *signatifrons* nearly, but with the vertex shorter and rounder and with a row of black spots on the anterior margin. Length of body, ♀ 2.75 mm., ♂, 2.25 mm.; width, 1.5 mm.

*Brachypterous form:* Vertex broad and short, width at base and length about equal, two-fifths longer on middle than at eye. Face broad, convex, broadest across antennal pits, rounding slightly above, more rapidly below to the narrow clypeus; clypeus nearly twice longer than broad, suture obsolete, genæ narrow, outer angles rounding. Pronotum broad and flat, more than twice wider than long, length equalling that of the vertex, anterior margin broadly evenly rounding, humeral margins straight, oblique, side margins distinct, carinate.

Elytra short, half longer than broad, not quite covering the fifth abdominal segment, obliquely truncate from apex of clavus; the outer corner rounding, apical cells minute or wanting; wings rudimentary. Abdomen stout, ultimate tergite much enlarged, overlapping the pygofer, a deep transverse furrow before the posterior margin in the female.

Color: Grayish olive with indistinct brownish maculations above, all dark below; vertex, basal two-thirds olive brown with a large obscure brownish spot on either basal half, a brown line anteriorly margining a white spot against either eye and continuing faintly across the disc, a broad margin before this line yellowish white, with four dark spots in a row between the prominent reddish-brown ocelli. Front dark brown with light arcs and a light dash below, clypeus light yellow with a large brown spot on the disc below, rest of face light with heavy dark-brown sutures. Pronotum nearly unicolorous, in strongly marked specimens five longitudinal light stripes appearing. Elytra sub-hyaline, the nervures light with narrow fuscous margins, usually a dark spot behind the middle of the clavus, another behind the first cross-nervure on the corium, and a third one on the costal margin in line with the other two; abdomen black, last dorsal segment broadly yellow, with two approximate black spots near the anterior margin, pygofer black on base and sides above, apex yellow; below all black except legs, which are more or less yellow on the other margins.

*Macropterus form* differs only in that the elytra and wings are fully developed, exceeding the abdomen by one-half mm.: Venation; veins on clavus with only one cross-nervure, apical cells long, central anteapical cell long, divided, the posterior part entirely beyond the apex of clavus, outer anteapical narrow, giving off a costal veinlet at either end.

Genitalia: ♀, ultimate ventral segment moderately long, slightly narrowing on the sides, outer angles cut off obliquely, posterior margin truncate, but so strongly elevated in the middle behind as to appear to be angularly emarginate from the outer angles, pygofer short, stout, equalling the ovipositor, clothed with a few short spines; ♂, valve twice wider than long, rounding exposed part of plates scarcely as long as valve, their tips rounding half the width of the valve, side margins nearly straight, oblique, pygofer extending much beyond the plates, their tips armed with a whorl of long bristles.

Described from three macropterus and three brachypterus examples, two examples from Texas (Aaron), three from Orizaba, Vera Cruz (Osborn), and one from Arizona (Gillette).

## LONATURA n. g.

Head conical, slightly obtuse, more than three times wider across eyes than length on the middle of vertex, curvature of posterior margin about one-half that of anterior. Front two and one-half times wider than on clypeus, width and length about equal, clypeus broad, parallel-margined, thorax broad, distinctly angled within, genæ rather narrow, roundingly angled, extending very narrowly below loræ to clypeus. Pronotum scarcely as long as vertex, nearly truncate behind, humeral margin straight, nearly meeting the eye, which curves around the lateral margin. Abdomen normal in form, ovipositor very long in female, extending beyond the pygofer, occurs in two forms; macropterous with fully developed elytra and wings reaching well beyond the abdomen. Elytra long and narrow, the costal margin nearly straight, appendix large, venation obscure, veins on clavus nearly parallel, united by a cross-nervure, the two branches of the outer sector again uniting after the forking of the inner branch and then forming only two anteapical cells, of which the outer is the larger, inner three apical cells greatly elongate, as long as the anteapicals, outer two on the costal margin smaller; in this form the scutellum is very large and strong. *Brachypterous form* in which the elytra only cover the second abdominal segment and the wings are rudimentary, the elytra are twice wider than long, broadest at the apex, venation obscure, the inner branch of the outer sector forking again before the apex, forming a single closed cell. In this form the pronotum covers the base of the elytra and most of the scutellum.

## LONATURA CATALINA n. sp. (Plate IV., Fig. 2.)

Form and general appearance of *minuta* V. D. nearly, occurs in two short and one long-winged forms. Length of body, ♀, 2.25 mm.; ♂, 1.85 mm.; width .9 mm. Length of macropterous form, 2.75 mm.

*Macropterous form.* ♀, vertex convex, the anterior margin rounding to the front, breadth at base and length about equal, over half longer on middle than next eyes, whole surface coarsely granulose, front very broad, transversely convex, sides rounding, rapidly narrowing just before the clypeus, clypeus parallel-margined, nearly half the length of the front, loræ subovate angled internally, genæ narrow, angles rounding. Pronotum scarcely as long as the vertex, half its length included in the curvature of the anterior margin, posterior margin shallowly emarginate, humeral margin scarcely oblique, disc pos-

teriorly obscurely transversely rugulose, scutellum very large, broadly triangular. Elytra long and narrow, overlapping behind, apical cells greatly elongate, the apex of clavus scarcely farther from apex of scutellum than from the apex of the wing.

Color: Vertex and face obscure yellowish, ocelli and disc of eyes black, margin of eyes, pronotum, scutellum and elytra olive-buff, sometimes with a metallic-brown reflection; tergum dark; below light, except ovipositor, which is invariably black.

♂ slightly smaller than female. Color: Vertex and face yellow, pronotum and scutellum yellowish-brown, elytra a deep smoky-brown with a metallic reflection, abdomen black, legs smoky.

*Brachypterous form*: ♀, form as above nearly, except elytra, head slightly more pointed, pronotum longer, overlapping the bases of the elytra and scutellum, elytra short, truncate, twice wider than long, abdomen rather long, all but the first two segments exposed; ultimate dorsal segment longer than the preceding, nearly as long as the pygofer, which are exceeded by the ovipositor. Color entirely and uniformly lemon-yellow except for the ocelli, eyes and ovipositor, which are black.

♂, form of the preceding female, except for the much shorter abdomen, last dorsal segment not differing from others, pygofer above very short, tipped with a brush of coarse hairs, color entirely and uniformly orange-yellow, except for the black eyes and ocelli.

♂ var. Color: Vertex and face yellow, pronotum and elytra deep smoky-brown, abdomen brownish-black, legs and bristles on tip of pygofer yellow.

Genitalia: ♀, ultimate ventral segment over three times wider than long, posterior angles a little rounding, posterior margin shallowly emarginate with a short roundly bilobed process usually wider than long, pygofer stout, two and one-half times wider than long, slightly exceeded by the black ovipositor. ♂ valve very small, posteriorly rounding, plates small, triangular, their apices narrowly produced, about twice longer than the valve, pygofer short, armed with stout bristles that equal the plates.

Described from numerous examples of all the forms from Burlington, Ames, Sioux City and Little Rock, Iowa, and from Yankton, S. D.

Larva: Form very similar to the brachypterous female, head slightly larger for the size of the body, body tapering regularly to apex of abdomen, wing-pads inconspicuous; color, light-yellowish, almost white during the first moult.

**Life History:** This species appears to be confined to the species of *Sporobolus* that form mat-like patches of grass, and on these they occur in marvelous abundance. The larvæ appear before the middle of May and are similar in appearance to the short-winged females, nearly white when small, becoming a light lemon-yellow by the time they are full grown. From these larvæ both long and short-winged adults follow before the middle of June. The short-winged forms are the most abundant and remain through July, depositing eggs for the second brood. The long-winged forms only remain a few days on the spot where they issued, but disperse to start new colonies. The second brood of larvæ appear in July and become adult in August, remaining through the autumn. The long-winged forms seem to be fewer in fall than in spring.

This is the most remarkably polymorphic species of *Jassidae* that has as yet been found, there being five distinct color variations, and two distinct structural types, these scarcely varying in the hundreds of examples studied. It seems remarkable that so abundant and interesting a species should have remained so long without notice.

LONATURA? MEGALOPA n. sp. (Plate IV., Fig. 1.)

Form and general appearance similar to *A. artemisiae*, but differing in venation, markings and wing length; head bluntly roundingly pointed, yellow, with an interrupted black band before the eyes, pronotum and elytra grayish-olive, abdomen black with white rings. Length, 3 mm.; width, a little more than 1 mm.

**Macropterous form:** Vertex half the width of head, one-third wider than length on middle, twice wider than against eye, disc convex, sloping, anterior margin broadly rounding to the face, ocelli well over the margin not far from the eyes, face broad and short, front convex in both diameters, gradually narrowing with nearly straight margins to the loræ, then rounding rapidly to the long straight-margined clypeus, suture with clypeus distinct but not depressed, loræ narrow, genæ roundingly angled, rather broad below the loræ. Pronotum very little longer than vertex, very broadly rounding in front, twice wider than long, side margins strong, humeral margins rounding. Elytra more than twice longer than wide, overlapping behind with a distinct appendix reaching a little beyond tip of abdomen, sub-hyaline with broad light nervures narrowly but distinctly margined with brown, apex with

a narrow fuscous band. Venation distinct, claval nervures nearly parallel, the outer one joined to the suture by a cross-nervure before the middle, inner branch of first sector joined to the second by two cross nervures, central antepical cell elongate posteriorly, constricted in the middle and divided by a cross-nervure, posterior portion broadest, antepicals on either side short, the inner one larger and diamond-shaped.

Color: Above grayish olive, nervures of elytra lighter with narrow brown margins, eyes black, vertex yellowish-olive; a medially interrupted transverse black band, widest at the margin, arises just before the eyes and above the white-margined ocelli; tip with two median black spots formed by the median light line and a yellowish transverse arc. Front brownish-olive with pale arcs, lower part of face decidedly yellowish, legs yellow, tergum and venter black, the posterior margins of the segments lined with white.

*Brachyterous form:* Structurally as above except that the elytra are scarcely longer than broad, truncate behind, only covering the third segment of the abdomen, the under wings rudimentary; the venation is nearly the same as on the basal part of the long wing, though it is cut off just back of the cross-nervure. In some examples there is a nervure just within the apical margin but no apical cells. Color as above with a slightly reddish cast; behind the elytra the abdomen is shining black with broad white margins to the segments.

Genitalia. ♀ ultimate ventral segment about three times wider than long, the lateral margin rounding in to the lateral angles, posterior margin shallowly excavated nearly its entire length with a broad truncate or slightly notched median tooth equalling the lateral angles, pygofers stout, not inflated, tipped with stout yellow hairs that exceed the ovipositor.

♂ abdomen rather long, valve broad and short, not longer than the ultimate segment, plates wider than valve at base, rapidly roundingly narrowing to the long attenuate points, margined with stout hairs, pygofer broad at base, short and rounding behind.

Described from nine males and thirteen females collected from a high knoll at Little Rock, Iowa, July 2d.

This species does not appear to be strictly congeneric with *catalina*, but more nearly related here than to any existing genus. Its generic value seems still too uncertain to warrant the formation of a new genus.

## DRIOTURA, n. g.

Head short, transverse, obtusely conical, vertex over twice wider than long, anterior and posterior margin nearly parallel. Eyes large, two-thirds the width of the vertex, slightly wedge-shaped, broadest next the vertex, narrowing and curving back around the sides of the pronotum. Face broad and short, front narrowing to one-half its former width on clypeus, conically inflated and slightly reflexed onto the vertex above, giving the impression of a pointed vertex with the ocelli back of the margin as in *Tinobregmus*. Clypeus short, parallel-margined, genæ broad and strongly angled. Pronotum short, slightly longer than vertex, transversely striated on posterior two thirds, posterior margin nearly straight, the lateral margin continuing around and below the eye as in *Jassus* without a lateral carina; abdomen short in male, much inflated in the female, suddenly narrowed to the long pygofer, which are considerably exceeded by the slender ovipositor. Legs stout. Elytra coriaceous, coarsely rugose, occurring in two forms:—*brachypterous*, in which their truncate tips scarcely cover the second segment of the abdomen, as wide or wider than long, the costal margin being curved around under the abdomen, extending broadly below the line of the eyes, anterior margin covered by the pronotum, — in this form the wings are rudimentary:—*macropterous*, in which they extend nearly to the tip of the ovipositor, broadly rounding behind. In this form the wings are fully developed and the pronotum is emarginate at the humeral angles, allowing freedom of motion to the elytra.

## DRIOTURA ROBUSTA n. sp. (Plate IV, Fig. 4.)

*Brachypterous form*: Size and form of *D. gammarioidea* V. D. nearly, slightly smaller and with longer vertex, mottled-gray with a transverse light band on pronotum and another on face. Length, ♀, 3-3.5 mm.; ♂, 2.75 mm.; width, 1.25 mm.

Vertex narrow, transverse, nearly parallel-margined, twice wider than long, anterior margin rounding on the sides, confused with the produced front in the middle, surface finely granulated, eyes triangular, laterally narrowing and curving around the pronotum; face broad, rounding, moderately short; genæ broad, their outer angles distinct; front parallel-margined above, then regularly narrowed to the clypeus, broadly produced above and confused with the vertex; clypeus parallel margined, slightly longer than broad, loræ regularly rounding, as

wide as the clypeus. Pronotum short, nearly four times wider than long, posterior margin nearly straight, slightly medially emarginated laterally, broadly rounding below and behind the eyes, touching the genæ, posterior two-thirds finely transversely striated, anterior margin finely granulated. Scutellum very small, tumid, triangular. Elytra coriaceous, coarsely shagreened, nearly square, convex, the costal margin extending down and around the pleura, anterior margin entirely concealed by the pronotum, venation obscure, apparently consisting of about eight nearly parallel slightly oblique nervures, the outer one forked beyond the middle, a broad space between it and the thickened costal margin, the third nervure from the inner margin just attaining the inner posterior angle and probably representing the claval suture. Abdomen broad, convex in both diameters, and in the female rapidly narrowing posteriorly to the narrow pygofer, which are roundly emarginate above to receive the exserted attenuate ovipositor.

Color: Vertex with variable markings of light-yellow and black; usually the following light markings may be made out: A narrow arcuated transverse line marking the boundary of the vertex and front, a median longitudinal line, a line on the posterior margin of vertex and bordering the eyes behind, an irregular line running forward from the posterior margin just inside the eye and a small spot in the middle of the disc on either side. Face light above with several concentric dark arcs, which deepen and coalesce below, forming a dark band which includes the antennal pits, below this a broad transverse light band including the apex of front and the superior half of the clypeus, and extending around on the genæ under the eye to join the band on the pronotum, the apex of clypeus, a small spot in each basal angle, the facial sutures and the lower margin of the genæ dark. Pronotum with the anterior third irregularly black, the remainder consists of a transverse light band which runs down on the lateral margin to connect with the light band on the face. Elytra, with the nervures and numerous irregular ramosed lines connecting them, light, the interspaces dark with finely maculate effect. Abdomen finely maculate, darker than elytra, below dark fuscous to black, ovipositor and spines on tibiæ reddish.

Genitalia: ♀, ultimate ventral segment twice longer than penultimate, posterior angles rounding, posterior margin nearly straight, sometimes medially elevated, pygofer long, wedge-shaped, much exceeded by the narrowly compressed oviduct, which is over half the

length of the abdomen. ♂, valve short, rounding, sometimes almost concealed by the broad ultimate segment, plates broad at base, the inner margins rounding, outer margin emarginate and impressed near the middle, tips obtuse, widely separated.

Described from eight examples from Sioux City and Little Rock, Iowa, collected by the authors, and four examples from Colorado, received from Prof. Gillette.

**Larva:** Similar in form to adult, reddish-brown with light markings, a light band on the face as in adult and another on the fourth abdominal segment, vertex slightly longer and more angled than in the adult, reddish-brown irregularly maculate, usually a pair of light spots between three dark ones on the anterior margin and a lighter spot against either eye, pronotum dark-brown with the anterior margin irregularly light, wing-pads brownish with a light spot just inside the posterior angle. Abdomen reddish with four longitudinal rows of light-colored bristle-bearing papillæ, transverse light bands occupying fourth segment continuing obliquely backward under the margin on either side of the seventh. Below, dark, a transverse light band on face below eyes as in adult; legs dark brown or black, fore and middle tibiae and a narrow line including the spines on posterior tibiae yellow.

**Life History:** The species is probably two-brooded as larvæ and freshly issued adults were collected the first week in July, and larvæ again late in the fall, indicating a life history very similar to that of *gammaroidea*.

**DRIOTURA GAMMAROIDEA V. D. (Plate IV, Fig. 3.)**

Short compact form with a bluntly conical head, stout body and a broad convex abdomen, in the female tipped with a long exserted ovipositor. Length, ♀ 3.5–4 mm; ♂, 3 mm. Width, 1.25–1.5 mm.

**Brachypterous form:** Vertex twice wider than long, the anterior margin slightly more convex than the posterior; front obtusely convexly inflated above, not so strongly as in *robusta*, ocelli distinctly on the dorsal aspect; clypeus oblong, parallel-margined, medially carinate on the basal portion; eyes wedge-shaped, narrowing outwardly; pronotum short, transverse; posterior margin nearly straight and overlapping the elytra, lateral margin compressed anteriorly beneath the curvature of the eye, posteriorly broader and extending around to the genæ below. Elytra coriaceous, coarsely rugose, convex, their costal margin enclos-

ing the pleura, together much wider than long, widening back from the pronotum to their roundingly truncate tips which scarcely cover the second abdominal segment. Abdomen beyond elytra very broad, convex, rapidly tapering posteriorly.

Color: Usually entirely glossy black, except the spines on tibiæ, reddish-brown, sometimes a narrow line on posterior margin of the pronotum, a somewhat broader one in front of the ocelli, the legs and the ovipositor in the female reddish-brown.

*Brachypterus var. flava* differs from above in color as follows: elytra, last two abdominal segments, genitalia, legs and sometimes the facial suture and a narrow margin around eyes, bright tawny yellow.

*Macropterus form.*: Thorax much stronger, the pronotum with the lateral margins shorter from the emargination of the humeral angles, allowing greater freedom to the elytra, eyes less recurved laterally. Elytra fully developed, reaching nearly to the top of the exerted ovipositor, widest before the middle, the costal margin rapidly narrowing to the humeral attachment, coriaceous in texture obscuring the apparently weak venation except for the inner apical cells, which are subhyaline with straight dark nervures; wings fully developed, as long as the elytra.

Color: Black, ovipositor and legs tinged with reddish-brown.

Genitalia: ♀, ultimate ventral segment parallel margined, two and one-half times wider than long, disc slightly convex. pygofer long, wedge-shaped, ovipositor slightly longer than in *robustus*: ♂, valve broad, rounding; plates broad at base, broadly convexly pointed, divergent from the base, outer margin medially impressed.

Specimens of both brachypterus forms are at hand from Wyoming, Colorado, Kansas, and Iowa; of the macropterus forms from Iowa only.

Larva: Form of the adult nearly, vertex slightly more pointed, depressed either side middle of the disc posteriorly, a transverse impression before the eyes, facial sutures and two anterior pair of tibiæ sometimes reddish, abdomen with moderately coarse bristles, legs stout.

Life History: The species occurs only on the wild grasses of the higher prairie land, is two-brooded, the first brood appearing in early spring from larvæ that have hibernated, larvæ again appearing in June; second brood adults in July and August, larvæ again appearing in the fall, becoming nearly full grown to pass the winter.

## ATHYSANUS CURTISII Fitch. (Plate V., Fig. 1.)

The life history of this species was outlined in the *Life Histories of Jassidae* (Proc. Ia. Acad. Sci., IV., p. 221), but the figures presented at this time will be of service in comparing the different species.

## ATHYSANUS BICOLOR Van D. (Plate V., Fig. 2.)

The life history of this species has also been discussed with that of the preceding species, but some details of life history remain to be determined. The figures will serve for comparison with related forms.

## ATHYSANUS STRIATULUS Fall. (Plate V., Fig. 3)

A rather slender species with long wings reaching well beyond the abdomen, about one-sixth of an inch to the tip of the wing in the female, the male being shorter and much smaller, testaceous-brown with dark markings on pronotum and wings, head shorter than pronotum, markings arranged in about three interrupted rows, sometimes obscure.

The larvæ are narrow brownish forms with a slightly more pointed head than the adult, the dark markings are nearer the margin except two spots near the base; there is a row of spots across the pronotum, two pair of large spots on the wing-pads and a smaller pair between the posterior ones.

This species is found abundantly over the prairie grass areas in different parts of the state. The larvæ were found very common the last of May and on into June. The males began to appear by the middle and the females a week later; the males disappeared by the second week in July, the females remaining until into August, the eggs having been deposited before the end of July.

## ATHYSANUS STRIOLA Fall. (Plate V., Fig. 4.)

This species somewhat resembles the preceding in size and the striations of the head, but is otherwise quite distinct. The head is much broader than the body, which tapers back to the narrow tip of the wings.

Color: Green tinged with yellow, a narrow black line across the head between the ocelli and the margin black, sometimes a curved line on the pronotum dusky.

The larvæ are olive-brown with markings almost as in the adult, the head is more strongly pointed and there are two dots between the black spot and the margin and two more against the eyes.

This species occurs only in low swampy places; a few full-grown larvæ and an abundance of adults were found the middle of August on a low swampy meadow where a species of *Juncus* abounded.

ATHYSANUS EXTRUSUS V. D. (Plate VI., Fig. 1.)

Short and stout, over one-fifth of an inch long and nearly half that wide, head short, no longer than the pronotum, wings shorter than the body in one form which does not fly, longer with the under wings more fully developed in the other form which flies readily.

Color: Brownish-yellow to dirty straw, usually with four irregular dark marks on the head; the males are somewhat smaller than the females and have a pair of long strap-like styles extruded from the abdomen behind.

The larvæ are stout, active forms, yellowish with reddish and fuscous markings on the head and four rows of white spots on the abdomen; the legs and body are sparsely clothed with long, stiff hairs.

Life History: They are found only in shaded locations, occurring most abundantly in a rich bottom-land pasture where the underbrush had all been cleared out, leaving only the larger trees; here the larvæ were found January 1<sup>st</sup> less than one-third grown; the day was warm and they were very active. They were again observed the first of April. Spring had fairly opened up and they were a little larger than when observed in the winter. They mostly moulted April 6<sup>th</sup> and again April 14<sup>th</sup>, the first adults appearing about the first of May, these being males; the females began to appear a week later, and by the middle they had all issued. The adults were abundant from then until into July. Frequent examinations showed that the eggs were not deposited until late in June or on into July, from which the larvæ hatch late in the fall and pass the winter.

ATHYSANUS TEXANUS n sp.

Somewhat resembling *colon* in ornamentation, slightly narrower, pale yellow with two black spots on anterior margin of vertex behind which are two broad parallel red stripes extending back across pronotum and

scutellum and three pairs of oblique ones on the elytra. Length 5 mm., width 1.75 mm.

♀ vertex narrower than in *colon*; length equalling three-fourths the width, side margins parallel, one-eighth longer at middle than at eye, disc flat, a straight transverse impression before tip, acutely angled with face, front broader than in *colon*, margins gradually roundingly narrowing to the parallel-margined clypeus, outer angles of genæ rounding, margin below nearly straight. Pronotum half longer than vertex, posterior margin long, humeral margin short and strongly oblique, lateral margin rather long, somewhat thickened, anterior margin more produced than in *comma* or in *colon*. Elytra three times longer than wide, the margins nearly parallel, venation indistinct near base, strong at the apex, pattern similar to the macropterous form of *colon* slightly irregular in the anteaipical cells, outer anteaipical cell very long, narrow, somewhat curved, at least three-fourths of its length projecting beyond the apex of clavus, central anteaipical still longer, curved, constricted in the middle, sometimes divided, inner anteaipical not extending much beyond clavus, inner apical margin oblique, first apical cell elongate, narrowly margining the costa; second, length and breadth nearly equal, set obliquely against the outer corner, the margining nervures curved, parallel.

Color: Pale yellow, a narrow line on the anterior margin of the vertex, a spot either side of the tip, a curved mark on the costal margin of elytra behind the middle, a spot on the second apical, and the posterior margin of the central anteaipical cell black, two broad stripes parallel across vertex, pronotum and scutellum, and three pair on the elytra parallel with the claval suture, the inner pair continuous with those from the scutellum, bright red; face dark brown, the sutures and outer margin of the genæ light-yellow, a black spot on the genæ above the loræ; legs pale, lined internally with black; tergum black on disc, margins yellow, penultimate segment yellow with a black median line, ultimate one with a median and two lateral lines black, pygofer yellow with a small black spot above.

Genitalia: ♀, ultimate segment with the lateral margins suddenly narrowed from near the base, then roundingly produced, the posterior margin with three obtusely-rounding lobes, produced part of nearly equal length and breadth; from under the emarginate angles arise two lateral membranes, resembling acutely produced lateral angles to the segment.

Described from six examples from Texas (Aaron).

## ATHYSANUS PUNCTATUS n. sp.

Superficially very strikingly resembling *obtutus* in form and color but with a shorter head, large spots placed further apart and the ovi-potitor not exserted. Testaceous with two black spots on the vertex just within the ocelli. Length, macropterous form, 3.5 mm.; brachypterous form, 2.50-2.75 mm.; ♂, 2.50 mm.

*Macropterous form:* ♀, vertex one-fourth wider than long, two-fifths longer on middle than next the eye, sloping, rather roundingly angled to the front. Front transversely convex, nearly parallel-margined to the antennae, then roundingly narrowed to the clypeus, clypeus about half longer than wide, suture indistinct, genae much longer below angle than in *obtutus*. Pronotum four-fifths wider than long, strongly rounding in front, side margins very short, posterior margin short, shallowly excavated, rounding to the long oblique humeral margin. Elytra twice longer than broad, overlapping at apex, apex nearly truncate, the outer angle rounding, the base of the apical cells equaling the tip of the pygofer. Venation weak and indistinct, appendix short, four broad apical cells and one long costal one, under wings fully developed.

*Brachypterous form:* ♀, elytra short and broad, reaching to the sixth abdominal segment, their tips shortly rounding from both sides, venation weak, the apical cells small and inconspicuous or wanting, under wing reaching the third or fourth segment, pygofer armed with a brush of stiff hairs.

*Color:* Light testaceous, vertex a little more yellow with two large round black spots on the anterior half, their diameter being about one-third the width of the vertex; before and between these on top of the vertex are two reddish-brown points. Eyes black, face and legs light testaceous. Pronotum testaceous, scutellum with a yellowish cast. Elytra sub-hyaline with a reddish metallic reflection, the black abdomen partly visible, ultimate dorsal segment broadly tipped with white, penultimate one narrowly so, venter black.

*Genitalia:* ♀, ultimate ventral segment scarcely twice wider at base than length on middle, the sides roundingly narrowing, posterior margin broadly rounding, a flat elevated area in the middle. Pygofer rather small, scarcely inflated, oviduct very stout, little if at all exceeding the pygofer. ♂, valve broadly triangular, twice wider than long, plates broad at base, regularly concavely narrowing to the acute points, two and one-half times the length of the valve, pygofer

inflated at the base, then compressed to the acute edge, equaling the plates.

Described from four females and two males swept from *Sporobolus*, Little Rock, Iowa, July 1st, and one female taken at Ames, Iowa, August 9th, and two females from Colorado through the kindness of Prof. Gillette.

**ATHYSANUS DENTATUS n. sp.**

Size of *punctatus*, nearly, stouter, vertex nearly flat, wings covering the tip of the ovipositor, light testaceous, two dark spots on the scutellum and two wavy transverse lines on the head. Length, 2.75-3 mm; width, over 1 mm.

♀, vertex one-fifth wider than long, obtusely angled before, disc flat, anterior margin rounding; front long and rather narrow, the sides straight, slightly narrowing; clypeus slightly broadest at base, little longer than broad, narrower than apex of front; loræ broader than clypeus, angled internally; genæ, margin straight either side the distinct angles. Pronotum more than twice broader than long, obtusely rounding before, the posterior margin nearly straight, humeral margin rounding nearly to the eye. Elytra not quite twice longer than wide, their rounding tips inclined to be flaring, without an appendix, never overlapping. Venation of the normal *Athysanus* type, the apical cells nearly square.

Color: Obscure yellowish or reddish-brown, vertex lemon-yellow, an irregular brownish line bordering an X-shaped figure as follows: commencing just before the back margin against either eye running in one-third the distance to the center, then throwing a loop forward one-third the distance to the ocelli, between these loops margining a perfect X resting on the posterior margin of the vertex, the separation of its bases being a black median line; another wavy line on the anterior margin connecting six dots as follows: one on either side of the tip, and a pair on either side of these, dividing the distance to the eyes on a line slightly above the ocelli; face yellow, sutures, apical portion of clypeus and the tips of the loræ strongly marked with brown, front with a broad median line widest below, and about eight lateral arcs, the upper pair very strongly arched above, second pair reduced to spots beneath the arches. Pronotum testaceous on the disc, anterior margin yellowish, behind which there are a few brownish spots, of which the inner pair is the most distinct; scutellum soiled yellow,

transverse impression and a pair of approximate spots on the disc in line with the two other pairs on the anterior margins of pronotum and vertex. Elytra sub-hyaline soiled yellowish-brown. Tergum and venter black, margins yellow.

♂, face and all below very dark, a few light arcs on the upper part of the front, vertex very dark, an irregular spot on the tip, a ring around the ocelli and the "X" light, pronotum and scutellum heavily marked with fuscous brown, elytra dark, the nervures lighter.

Genitalia: ♀, ultimate ventral segment broad on basal third, beyond this the lateral margins are sharply constricted and the whole surface depressed, lateral angles produced, forming acute teeth, nearly half as long as the width of segment at base, posterior margin deeply emarginate between these teeth, forming two smaller rounding or obtusely angular teeth separated by a median notch. Pygofer inflated, slightly exceeded by the stout ovipositor: ♂, valve very large, triangular, the apex slightly produced, plates much enlarged, broad at base, where they are convex, extending beyond the valve about half its length, without narrowing, their truncate tips standing nearly perpendicular to the plane of the valve, and together with the short pygofer forming an enclosed cavity, spines on pygofer stout, rather long, extending down outside the plates.

Described from eight females and one male from Colorado, one from Van Duzee collection, three from Prof. Pammel, and four females and one male from Prof. Gillette.

#### EUTETTI<sup>X</sup> SCABER n. sp.

Form of *lurida*, dark, fulvous-brown above, with a large angular area on the outer base of the elytra. Length, ♀ 6.5 mm; ♂ 6 mm. Width, 1.75 mm.

Vertex parallel-margined, over three times wider than long, transversely depressed back of the rounding margin, front broad, wedge-shaped, longer than in *lurida*, the clypeus hardly widened at the tip, genae with the outer margin rounding. Pronotum broad, convex, highest behind, the humeral margin straight, parallel with the margin of the scutellum. Elytra broad, only slightly overlapping behind, nervures indistinct.

Color: The vertex reddish-brown anteriorly with five white spots confluent with the margin, posteriorly with two white spots just before the margin slightly nearer each other than the eyes, face light-yellow, a black spot against the outer margin of the loræ, pronotum and

scutellum chestnut, finely irrorate, two white spots on the scutellum against the ends of the transverse depression and another at tip; elytra heavily irrorate, almost clouded with dark chestnut, except for the outer margin of the basal part of the clavus the entire basal half of the corium, and an indistinct transverse band just before tip strongest on the costal margin. The basal part of corium is hyaline yellowish, oblique behind, bordered above by a narrow white line on the margin of the clavus and extending forward across the lateral margin of the pronotum to the corner of the eye; below yellowish.

Genitalia: ♀, ultimate ventral segment moderately long, lateral angles rounding, posterior margin slightly produced and feebly notched in the middle, pygofer much longer than in *lurida*, obscure yellowish with brown spots: ♂, valve rounding, plates triangular, twice the length of the valve, their margins clothed with long hairs.

Described from three females and one male, collected at Ames, Iowa; two of them swept from white oak.

#### EUTETTIX CINCTA n. sp.

*Eutettix jucundus*,\* VanDuzee. Psyche, VI., p. 307, 1890; Osborn, Proc. Iowa Acad. Sci. I. pt. 2, p. 120, 1892.

Size of *scaber* nearly, elytra narrow and vertex pointed. Dull reddish-brown with an oblique obscure saffron band before the middle of the elytra. Length, ♀, 6 mm.; ♂, 5.25 mm.; width, 1.60 mm.

Vertex strongly rounding, one-third longer on middle than next to eye, disc flat with transverse depressions just behind the rounding margins; face long, more acutely angled than is usual in this genus; front narrow, nearly twice longer than broad, margins straight; genæ parallel-margined below the eyes, distinctly angled. Pronotum short, one-half its length included between the eyes, transversely striated except for the depressed anterior margin. Elytra rather narrow, compressed behind. Venation; veins on clavus approximate before the middle; anteapical cell usually divided, anterior portion small, nearly circular, the posterior portion narrowing behind; apical veins curved, usually another small round cell behind the central anteapical, about five transverse veinlets on the apical half of the costa.

Color: Vertex and superior third of front, soiled-yellowish, ocelli margined with red, remainder of the front rusty-brown, the rest of face

\* The *Jassus jucundus* of Uhler listed by VanDuzee as *Eutettix jucundus* is, as later suggested by VanDuzee, a *Paramesus* near *twiningi*, and the species of *Eutettix* upon which the reference was made has been hitherto undescribed.

darker; pronotum soiled-yellowish irrorate with brown. Scutellum light-yellow; four spots in a row, two on disc and two on margin and two just before apex on margin. Elytra milky, washed with yellowish, the nervures red; an oblique dark-brown band behind the middle, composed of blotches occupying the central portions of the cells, a white spot just before the middle of the central anteapical cell, a transverse median band on the clavus and the broad bases of the costal and outer apical nervures black, all of third and basal half of first joint of posterior tarsi white, the rest black.

Genitalia: ♀, ultimate ventral segment rather long, slightly produced in the middle, the outer angles rounding: ♂, valve nearly concealed by the ultimate segment; plates broad at base, one-half longer than wide, the margins slightly concave, thickly set with coarse bristles.

Described from numerous examples of both sexes collected at Ames, Iowa, two specimens from Texas (Aaron), and one from Washington, D. C. (Heideman).

#### EUTETTI~~X~~ MODESTA n. sp.

Form of *lurida* nearly, small, vertex and scutellum yellowish, pronotum and elytra fulvous with a narrow parallel-margined transverse light band before the apex of clavus. Length, ♀, 5.5 mm.; ♂, 4.5 mm. Width, 1.5 mm.

Vertex short, broadly rounding, parallel-margined, disc flat, sloping, striate, the striations converging towards the apex, behind which there is a short transverse depression; face convex, rounding to the vertex; front three times wider at base than at apex, margins slightly rounding; genae rounding. Pronotum large, transversely striate, humeral margin straight, meeting the eye below the middle; elytra long, slightly flaring, but overlapping behind; venation rather obscure, a number of irregular reticulations near the apex and along the costa, a second transverse nervure present.

Color: Vertex and face yellow, a small black spot on the outer margin of the lorae; pronotum yellow, coarsely irrorate with fulvous on the disc posteriorly; scutellum yellow, two small approximate spots on the disc pale reddish-brown, a triangular spot within each angle, light-olive; elytra with a narrow transverse yellowish subhyaline band midway between the apex of the clavus and the apex of the outer claval nerve, the rest of the elytra clouded with dark fulvous brown

strongest against the light stripe and fading out on the base and along the costal margin, nervures and ramosc lines reddish on the lighter parts, apex of claval nerves and a pair of round spots between them, white.

Genitalia: ♀, ultimate segment nearly three times wider than long, posterior margin concave with a broad, truncate, or slightly notched median tooth; pygofer about three times longer than the segment, stout, yellowish with brown spots on the bases of the spines: ♂, valve long, rounding behind with an acute median tooth; plates broad, slightly narrowing to the broad almost truncate apex, disc convex, margins with long hairs.

Described from one male and one female swept from second growth oaks, Ames, Iowa. A very neat and distinct species.

PHLEPSIUS ALTUS O. and B. (Plate VI., Fig. 3.)

This species, described in our previous paper (Proc. Ia. Acad. Sci., Vol. IV., p 228), has been taken during the summer of 1897 very abundantly at a number of points in the northwestern part of the state as well as at Ames.

This is a shorter and stouter species than *irroratus*, with a shorter, rounder head and broader wings, which are usually flaring at the tip. The head is only a little longer in the middle than next the eyes, about half the length of the pronotum. General color, dark reddish-brown, from the innumerable fine lines and spots on a light ground, a number of clear white spots on the wings and a row of alternate white and black spots on the outer margin. The species of this genus are very much alike in color and it is only by careful study of structural characters that they may be accurately separated. The short, broad form of this species, however, separates it from most of the species occurring here.

The larvæ are very broad and short, even more so than the adult, the head being longer proportionately. They are of a dark grayish-brown, sometimes with a reddish cast, being in fact dirt-color as near as it can be imitated.

They are found in abundance wherever *Bautelia hirsuta* occurs. In Iowa this grass is only found on very high prairie land, usually capping the tops of the hills, so that this species has a somewhat local distribution. Further west where the grama grasses form a large share of the grazing this species may be expected to occur very generally.

The species is single-brooded, the larvæ appearing by the middle of May, as small, almost round, gray specks clustered on the ground around or in among the stems of the grass clump, springing a foot or more away if disturbed. Towards the last of June they become full-grown and may be found on the ground under the edge of the grass clump, so closely resembling the dirt and rubbish as to be hardly discernable. The adults appear the last week in June and the first week in July, and remain in decreasing numbers through August.

PHLEPSIUS NEBULOSUS V. D. (Plate VI., Fig. 4).

Very similar in form and color to *irroratus*, but much larger, being about three-eights of an inch long and about one-fourth that broad; the head is broader and less pointed and much thinner on the edge.

The larvæ are very broad and flat, with longer and flatter heads than the adult, the abdomen tapering to a sharp point, clear creamy-yellow with innumerable fine brown points arranged in wavy lines, a light stripe down the middle and three rows of spots on each side of the abdomen, the outer row with black margins, the eyes are dark red and there is a dark spot on either side of the tip of the head.

Nearly full-grown larvæ were found the third week in June in clumps of switch grass (*Panicum virgatum*) feeding upright on the broad stems which they resemble in color. Placed in the cage they issued as adults about the first of July. Adults were taken from the last of June through July, seeming to stay closely by low ground where the grass occurs.

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ERRATA.

Page 60, line 2, for "2.25" read "1.25."

Pages 70 and 73, for "Plate II." read "Plate III."

In part of edition, on page 65, "claeta" should read "laeta."

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The plates accompanying this paper have been drawn from nature by Miss Charlotte M. King under the personal supervision of the authors. They are used in this connection by courtesy of the Iowa Experiment Station.

## NOTCHED BONES FROM MEXICO.

BY FREDERICK STARR.

AN interesting paper, forming article V of volume X of the *Bulletin of the American Museum of Natural History*, has just appeared under the title of *Marked Human Bones from a Prehistoric Tarasco Indian Burial Place in the State of Michoacan, Mexico*. It is the production of Carl Lumholtz and Aleš Hrdlička. In it are described, with much careful detail, twenty-six human bones marked with transverse notches, found at Zacápu, in Michoacan. They were found associated with skeletons. Mr. Lumholtz thinks these specimens are to be understood from the idea that possession of any part of a human being gives power for sorcery over him and from the notion that power is latent in the bones of the dead. He summarizes his theory in this statement: "I believe that the marked bones of this Tarasco burial-place were the bones of enemies, kept as amulets or fetishes and buried with the dead warrior who procured them. Their possession meant to the conqueror the strength of the subdued man, as a sign of which he placed the transverse marks on them, symbolic, perhaps, of the count of the dead man's days. The extraction of the marrow would further help to make the fallen enemy a prisoner of the victor, by eviscerating the bones and robbing the ghost of his last independent mortal power."

It is Dr. Hrdlička who makes the detailed examination of the specimens. After presenting the results of his minute study, he says: "The bones were trophies from fallen enemies and the grooves signified the number slain by the owner of the bones. . . . Or, the grooves may have served the rôle of simple records of age, of great feasts, or of other events. . . . Or, finally, the bones may have served some as yet undetermined religious or ceremonial purpose." The above quotations amply show the conclusions reached by the authors mentioned.

I have in my possession probably thirty-five or forty specimens of such notched bones. I intended to publish nothing concerning them until my *Manual of Mexican Archaeology* should appear. It seems, however, proper at this time to present a preliminary paper upon the subject. My specimens are all from one site, not far from the city of

Toluca, in the State of Mexico. Some of the specimens found were donated to the State Museum at Toluca; others are yet unpacked; twenty-one, however, are available for immediate examination. The first of these specimens were dug out early in 1895; the rest have been taken out at various times since. They were associated, like the Michoacan specimens, with human skeletons. Like those described by Lumholtz and Hrdlička, they are all long bones. Among them are 14 femora, 2 humeri, 5 tibiae. That this material may be available for study and reference, I present in tabulated form the data, yielded by its examination. Anatomical data are omitted as hardly relevant to our question.

In this table the bone is considered as divided into parts from above down: where the third fourth is said to be occupied with notches, it is the third fourth counting downward. The average separation is given by the measure from the middle of one notch to the middle of the next notch. The depth given is only approximate and is the depth of the deepest notch; it is rare that the notches are of the same depth: the deepest are usually the middle ones—those at the ends of the series are generally notably shallow, though not always.

It is proper here to indicate the location of other specimens so far as I know them. Besides those already mentioned in the Museum at Toluca there are eight specimens in the National Museum in the City of Mexico. These specimens I have examined. Most of them are far more decomposed than the specimens already described, but are plainly the same thing. In the catalogue of the Anthropological Collections published by the Museum we read: “*Worked bones of Tlatelolco and Xico*: such were marked to record the hunt. Of the Chichemecs they say, ‘that they were the greatest murderers and robbers in the world. They are so proud of this inhumanity, that for a blason they carry with them on a bone the count of those whom they have killed, and some of them contain twenty-eight, thirty, or even more.’ (Dic. Univ. de Hist. y Geog. Apen., vol. ix., p. 69). We have met with an example in Anacuco, Chalco, like those of Tlatelolco, with twenty-eight notches.’” (Translated.)

Not only were human bones so notched, but animal bones as well. Señor Chavero, according to Orozco y Berra (see quotation below) had a rib of a fossil elephant, which had been so treated.

I cannot claim to have diligently examined the literature for mention of such notched bones. Since securing my first specimens I have,

## 14 FEMORA.

STARR—NOTCHED BONES FROM MEXICO.

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Marks occupy	Number originally numbered remained in specimen	Average regularity	Separation regularity	Least and greatest sep-		Use	Apparent	Site of marks	Remarks.
				sep.	sep.				
1. (left)	middle third	8	8	Yes	11.4	11-12	4	Much	Anterior surface
2. (left)	second fifth	5	5	Yes	10.2	8-12	3.5	None or little	Anterior surface
3. (left)	middle fifth	6	6	Yes	9	8-10	1.5	Little	Anterior surface
4. (left)	middle fourth	8	8	Yes	8	6-9	3	Yes	Anterior surface
5. (left)	mid. two-thds	9	9	Yes	17.5	7-18	3.5	Yes	Anterior surface
6. (left)	middle third	10	10	Yes	9.6	8-11	4	Some	Anterior surface
7. (left)	mid. two-fifths	8	8	Yes	14.5	14-16	4	Yes	Anterior surface
8. (right)	mid. two-fifths	9	9	Yes	11.5	11-13	5	Yes	Anterior surface
9. (right)	6th-7th tenths	7	7	Yes	9.5	9-11	2.5	Yes	Bone much decomposed.
10. (right)	middle half	7	7	Yes	15.3	14-16	3	No	Anterior surface
11. (right)	middle half	8	8	Yes	12.4	11-14	2	None or little	Strongly marked.
12. ?	third-fourth	—	—	Yes	10	8-12	3	Yes	Anterior surface
13. ?	middle half	8	8	Mod.	13.5	12-14	2	Yes	Deep and clean cut.
14. ?	middle third	9	9	Mod.	6.6	5-9	1	Yes	Anterior surface

## 2 HUMERI.

1. (left)	middle third	6.6	12	Irreg.	10	10	5-13	1.5	Yes	Two edges.	
										sep.	sep.
2. (left)		8	8	Yes			9-12	1.5-2	Yes		

## 5 TIBIAE.

1. (left)	middle third	5	5	Yes	19	18-20	2	Little or none	Interior surface	Notched on two edges; one set not- ably used.	
										sep.	sep.
2. (right)	lower half	8	8	Yes	13.4	12-15	2	Little or none	Interior surface	Notches far apart; cut clear across.*	
3. (left)	middle third	10	10	Yes	8.2	7-10	2	Much	Internal border	Sharp and clean cut. <sup>†</sup>	
4. (left)	third fourth	8	8	Yes	10.7	9-14	2	Yes	Internal border	Somewhat decomposed.	
5. (left)	second fourth	8	8	Yes	7.2	6-9	2	Much	Internal border	Platycomemic.	

\* An unusually wide surface.  
† Bone very platycnemic.

however, noted such references as I have met in my reading. They abundantly suffice to determine the purpose and the Aztec name of these bones. While Biart,<sup>1</sup> Brinton,<sup>2</sup> Orozco y Berra,<sup>3</sup> Sahagun,<sup>4</sup> Tezozomoc,<sup>5</sup> and others refer to them, two quotations will suffice to show (1) what these notched bones were called and how they were used, and (2) that they were sometimes buried with the dead.

In a foot-note to the description of the funeral ceremonies of the ruler Axayacatl given by Tezozomoc, Orozco y Berra says: "The *omichicahuaz* was not properly a rattle: this musical instrument, if it can be so called, consisted of a bone of a deer, sometimes of a man, with deep incisions perpendicular to its length, from which resulted parts successively depressed and elevated: this notched surface was rubbed either with another bone or with a shell, producing a sound not particularly agreeable. We have examined in the collection of our friend Alfredo Chavero, a fossil elephant rib, converted into this instrument, very similar to one used by African negroes." (Translation.)

This word *omichicahuaz* is variously spelled. Thus it occurs as *omichicahuaz*, *umichicahuaz*, *humichicahuaz*, *omichicaoatzli*. Dr. Brinton states the etymology os *omitl*—bone, *chicahuac*—strong.

The second passage for our purpose is from Orozco y Berra's *Historia*. (l. c.) The author there presents an account of Axayacatl's funeral ceremonies apparently abridged from Tezozomoc. From it we translate:

" . . . The body was covered with four garments one over the other. The first of Huitzilopochtli . . . . . ; the second of the god Tlaloc . . . . . ; the third garment of the god Yohualahua, for the head the feather *tlauhquechotzontli*, in the hand a deer's bone notched such as is employed in certain dances for making noise, called *humichicahuaz*, and in the other hand a staff with timbrels ; the fourth garment was that of the god Quetzalcoatl . . . . . "

We certainly have in these passages adequate description of such notched bones as we are studying. They are asserted to be musical instruments and it is stated that they were at times buried with the

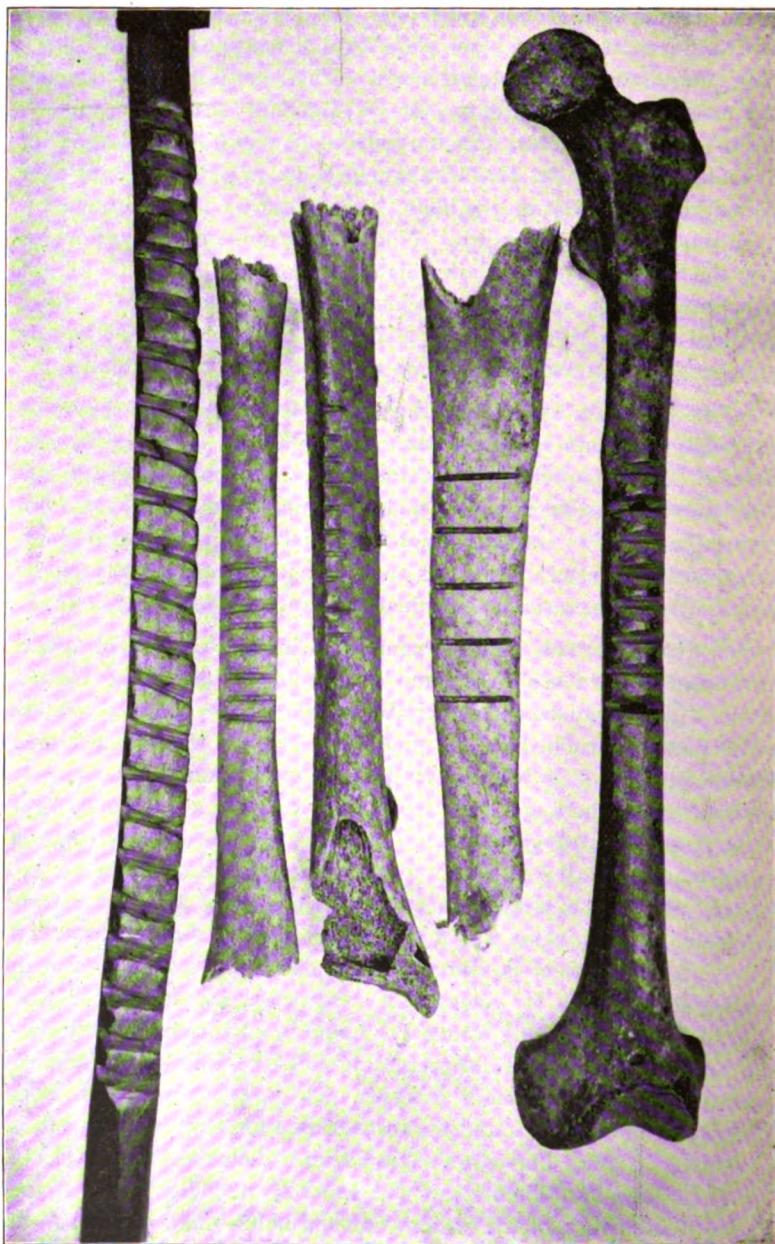
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1. Biart: *The Aztecs*, p. 305.
2. Brinton: *Ancient Nahuatl Poetry*, p. 24.
3. Orozco y Berra: *Hist. Ant. y de la Conquista de Mex.*, vol. iii., p. 360.
4. Sahagun: *Hist. gen. de las Cosas de Nueva España*, lib. viii., cap. 20, p. 308.
5. Tezozomoc: *Cronica Mexicana*, cap. 55.

dead. In the light of this knowledge the bones may be reexamined. Many if not most of them show plain signs of wear produced by something rubbed across the notched space. This wear is easily recognized after attention is directed to it. In the Lumholtz collection there is but one perfect humerus. Such a humerus is pictured in Plate vi. of Hrdlička's paper. Dr. Hrdlička says of it, (p. 72) "No rubbing over the markings apparent on the bone." Yet in the photo-reproduction given rubbing is *plainly* shown. Not all, but most, of the specimens from the State of Mexico show this wear distinctly, and it is of just such character as would be produced by the scraping of a bone back and forth. Moreover it is possible to tell in which direction the stronger *down* rub was made, as contrasted with the lighter return.

In Mr. Lumholtz's specimens there is a hole in one end of the bones (especially the femora) apparently for the purpose of removing the marrow. Mr. Lumholtz lays considerable stress upon this point. If the bones were to be used for rubbing time for dancers, would not dryness be desirable and would not this be more quickly gained by removal of the marrow? While this appears to us reasonable, it should be mentioned that the series here studied does not have such holes in them.

Two devices for rubbing time somewhat similar to the *omichicahuaz* are known to us in use among modern Indian tribes in the United States. Tonkaway women in certain dances use notched sticks across which bones are rubbed to give time. One end of the stick is rested against the ground, or better upon the bottom of a pan or other vessel; the other end is held up by the left hand; the bone, taken in the right hand, is rubbed strongly down and more lightly back. The result is much more musical and much less disagreeable than might be expected; the rhythm is excellent and the aid to song and dance considerable. I secured several of these sticks among the Tonkaways in 1893 and one of them is represented in our plate, side by side with some notched bones for comparison. Particular attention should be paid to the wear resulting from the rubbing in both cases. Very similar rubbing sticks—and some presenting points of difference—are used among some of our Pueblo Indians. An excellent specimen from Wolpi, the notched stick and the scapula used for scraping across it, is illustrated in James Stevenson's Catalogue. These notched sticks of the Tonkaways and Pueblos are the exact representative, still in use among living tribes, of the ancient notched bone—the *omichihuaz*—of the old Mexicans.



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**DESCRIPTION OF PLATE.**

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- 1.—Notched stick—Tonkaway.
- 2.—Tibia: No. 5 in table.
- 3.—Tibia: No. 3 in table.
- 4.—Tibia: No. 1 in table.
- 5.—Femur: No. 4 in table, showing rubbing.

## A SHELL INSCRIPTION FROM TULA, MEXICO.

BY FREDERICK STARR.

PERHAPS the most interesting piece of carved shell so far found in Mexico is the specimen now to be described. It was found at Tula, a town lying fifty miles north of the City of Mexico, famous as one of the localities explored by Charnay and one of the traditional sites of the Toltecs. The specimen at one time belonged to Dr. Antonio Peñafiel and will be figured and discussed by him in his great work on *San Juan de Teotihuacan*. As this work, from its great cost, will have but a small circulation, it seems desirable to place the specimen within reach of a larger number of students than are likely to be its readers.

The specimen consists of a rather irregularly shaped fragment of *haliotis* shell. It has suffered from time's effect and shows a dangerous tendency to splinter and scale. The material is nacreous and still retains much of its lustre and some of its play of color particularly on the outer, convex, surface. The fragment has been trimmed and ground to an imperfectly rectangular form; one corner is quite sharply right angled and the two edges there meeting plainly show the operation of grinding. On the inner, concave, surface are three drilled holes. Two of these, near the right hand border, are carried completely through the specimen and were apparently intended for the passage of a cord for suspension. These holes were drilled with a solid drill and from both sides; the lower one is smooth bore and of nearly uniform diameter; the upper more plainly shows the drilling as done from both sides and is smaller at the middle where the two drillings meet. The diameter of these holes is about 4mm. The third hole is situated near the upper left hand corner but was never bored entirely through the shell. On the outer, convex, surface we also find three holes: two are those already described as piercing the piece and are near the left hand border; the other, never finished though carried almost through, is near the right hand border, not far from the bottom. The specimen measures 93mm. in height, 57mm. in greatest breadth and not more than 8mm. in thickness.

The whole inner, concave, surface is occupied by an elaborate carving representing a seated figure. The legs are crossed, the feet bare;



ornamental bands surround the ankles. A band passes around the waist and from it there appears to hang some sort of an apron or other ornament. The left arm is akimbo and the hand, with fingers bent at the knuckles rests upon the knee; a cuff or ornamental band surrounds the wrist. Of the right arm only the shoulder and extreme upper part are visible, the rest being broken off. About the neck is a necklace of almost circular large beads, eight of which are plainly shown. From it there hangs over the breast a plate or ornament, apparently of jade (as the piece much resembles the conventional Aztec sign for



*chalchihuitl* or greenstone); it consists of a plain elliptical or nearly elliptical central face surrounded by a beaded border. From it in turn hangs a pendant consisting of a broader central band and two narrower divergent pieces. The ear contains an ear-disk with pendant. The face, shown in profile, is notable for its prognathism, the strong somewhat aquiline nose, and the retreating, perhaps artificially deformed forehead. The forehead is crossed by a plaited band, above which rises an elaborate helmet head-dress with crest of long pendant plumes. The carving is handsome and boldly done. The workmanship is more Mayan than Aztec or Zapotecan.

This Mayan character of the art is in keeping with the inscription on the reverse of the specimen, which is the feature most deserving of careful study. This is located in the lower part of the upper third of the piece. The characters composing it are four in number and are contained in rectangular spaces formed by straight deeply-cut lines; these form a continuous band across the specimen. Two of these spaces are entire; the other two are partially destroyed. The characters contained within them are clearly related to the "calculiform" characters of Mayan inscriptions on monoliths, pottery vessels and carved greenstones and to those of the codices. The figure given in the plate gives a perfect idea of the characters, their arrangement and their position. For purposes of comparison, however, they are represented here in a special cut. This has been made by taking a tracing over the photograph and then perfecting it.



Should these characters prove, as I believe, to be Mayan we are naturally, though not *necessarily*, led to one of two startling conclusions:

(a) That the calculiform characters were already developed and were in use at Tula, far outside of the recognized Mayan region, before the abandonment of that city—or (b) that relations of trade and barter connected Tula, at the time of its occupancy, with some Mayan region—presumably to the East, South, or Southeast.

## THE GENUS PEDIOPSIS.

(A Review of the North American Species.)

BY HERBERT OSBORN AND ELMER D. BALL.

This genus is one of the most difficult of the *Jassoidea* in which to define species, for although with fresh specimens there is little difficulty in separation, and in most cases the host plant of itself will decide as between the species most likely to be confused, still, as a group, the species are remarkably alike in structural characters, the variations being usually those of degree rather than of kind. The genitalia, the ordinary recourse when other characters fail, are utterly valueless, the variation for the whole group being scarcely more than the ordinary variability in a species.

The few structural characters available, together with the color have, however, been found sufficient to readily and accurately separate those species under observation in a series of life-history studies in the group,\* and as the result of the determination of the range of variation in these species, it has been found much easier to refer some of the more widely variable examples of other species to their proper places.

The greatest difficulty in working over material in this group arises from the fact that the green color in most of the green species "fades" or changes to a dirty yellowish when immersed in alcohol or on exposure to a strong light, thus altering very much the appearance of the specimen.

The black marking on the propleura has been found to be fairly constant in most of the species in which it exists, and is the readiest means of separating some species; but as it is often only a sexual character and sometimes fails when it is needed the most, as in some of the lighter colored females of *ferruginooides*, it has been thought best to depend on other characters for the synopsis and thus leave it as a sort of check, except in the case of *occidentalis* where, with our imperfect knowledge of the species, it appears to be the best character available for the purpose.

\* *Dav. Acad. Sci.*, Vol. VII., 1897, and *Ia. Exp. Sta. Rept.*, 1897.

The material upon which this paper is based consists of the types of the Van Duzee species together with the entire collection upon which his review of the genus was founded; the types of the Osborn and Ball species with an extensive series of the Iowa forms, the result of the life history work; typical specimens of the two Gillette and Baker species, as well as a series of the Colorado forms through the kindness of Prof. Gillette, together with numerous smaller series from different parts of the country, mentioned under the species. Van Duzee has so thoroughly characterized the genus \* that there is little to add in that respect.

In the determination of the species he was less fortunate, as on examination of a large series the specimens determined as Fitch's *trimaculata* proved to be only an obscurely marked form of *bifasciata*, often found in specimens collected late in the season, and as a result of this error the real *trimaculata* was described as *insignis*. Still, too much credit cannot be given for the careful and painstaking manner in which he brought out specific characters, hampered as he was by the insufficiency of the material at hand. Of two of his species, *punctifrons* and *occidentalis*, no new material is at hand so that nothing further in regard to their variation can be given, and of *canadensis* only two additional females, both too much altered in color to aid in characterizing that species, have been seen.

Of most of the rest of the species an abundance of material has been at hand showing the ordinary variation of the species and the normal differences in the sexes.

Although doubtless somewhat artificial, the grouping in the synopsis is an attempt to show some of the more prominent variations in the generic type and their probable relationship. In the first group are placed species like *tristis*, with stout bodies, strong elytra, and deep colors.

The second group includes all the species with transversely banded elytra and is closely connected to the third by *bifasciata*, in which the second band is often obsolete.

The species of the fourth or *viridis* group all have males much smaller and darker than the females.

The *punctifrons* group is probably the most distinct and easily recognizable of all; here the males as seen from above scarcely differ in size

\* Review of the North American Species of *Pediopsis*, Ent. Amer., Vol. V., pp. 165-174.  
Sept., 1889.

or color from the females, but the face is usually more strongly marked. It would seem as if this group came nearer the European *virescens* than either *viridis* or *occidentalis*, the former species possessing both a spot on the face and the green color in the males.

The members of this genus are widely distributed throughout the North Temperate Zone, Europe possessing a larger number of species than are at present known in America, none, however, being common to the two countries though a number are closely related.

They are almost exclusively tree feeding forms; the twelve North American species of which the food plants are known are all tree feeders, and most of the European species are so credited.

In both countries the greatest number of species, and those the most abundant and widely distributed, occur on the different species of willows; besides these in this country the cottonwoods, the wild plums and the honey locust each have two species, while of three species, *canadensis*, *occidentalis*, and *punctifrons*, nothing is known as to food plants. The two latter are closely related to willow feeding forms in both countries, and it may be conjectured that they will also be found to occur on willows.

The larvæ are all short, stout-bodied forms; the head is short and straight, appearing from above as a narrow band in front of the broad, straight-margined pronotum, which is slightly emarginate at the anterior corners to receive the eyes; the abdomen is broad and short, rounded on the lateral margins and dorsally carinate. In color they usually mimic some part of the tree on which they feed and are detected with difficulty when at rest.

The larvæ and adults are often very nearly alike in color, but the characteristic anterior angle of the adult is entirely wanting in the larvæ, those with acutely angled heads, having in the larvæ as short, straight heads as their blunter headed relatives. The only noticeable difference is a slightly increased width between the eyes, the anterior angling of the pronotum and the consequent production of the head taking place entirely during the change to the adult. In this respect they agree with the *Bythoscopus* larvæ, and both forms show a much closer relationship to *Idiocerus* through their larvæ than would appear from the adult structure. On the other hand *Agallia*, though closely resembling *Idiocerus* in adult characters, seems to depart most widely from it in the larval stage.

All the species in which the life history is known are single-brooded. The larvae appear during early summer and usually mature by the last

of June. The adults occur from the middle of June until the middle of August, varying with the different species. In general the adult stage of a given species lasts scarcely six weeks, while for the individual it is less than a month. The males usually appear a full week before the females and disappear as much earlier.

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#### ARTIFICIAL KEY TO THE SPECIES.

- A. General color above fuscous or rusty brown, scarcely a trace of orange or green.
  - B. Face greenish, a fuscous band above and a large spot below the ocelli..... *tristis* V. D.
  - BB. Face unicolorous.
    - C. Elytra broadly rounding at apex, dull brown with two or three round pale spots, female segment short..... *trimaculata* Fitch.
    - CC. Elytra longer and slightly pointed behind, rusty brown, darker in the male, without distinct spots, female segment longer than width at apex..... *sordida* V. D.
- AA. General color orange or green, often maculate with ferruginous or fuscous.
  - B. Face unicolorous, species of medium or large size.
    - C. Elytra with more or less of orange, or maculate.
      - D. Elytra with a transverse hyaline band before the apex of clavus.
        - E. Vertex and face yellowish or ferruginous.
          - F. Elytra with a single hyaline band ; vertex right angled..... *ferruginooides* V. D.
          - FF. Elytra with two transverse bands ; vertex obtuse .....
        - EE. Vertex and face olive brown, elytra hyaline, brownish with a broad fuscous band at the base and a narrower one before the apex..... *bifasciata* V. D.
      - DD. Elytra without distinct transverse hyaline bands, costal margin lighter.
        - E. Pronotum greenish.
          - F. Pronotum with a black stripe just within the lateral margin, entire clavus and a narrow stripe on around to apex of corium black..... *suturalis* O. & B.
          - FF. Pronotum unicolorous green, clavus dark brown at base, apex and all of the corium except the costal margin hyaline brownish..... *basalis* V. D.

- E. Pronotum saffron yellow, elytra brownish on the disc..... *crocea* O. & B.
- CC. Elytra hyaline greenish in the female, slightly brownish or fuscous in the male.
- D. Pronotum right angled before, varying from orange to green in female, olive brown with two impressed black dots behind each eye in male..... *erythrocephala* G. & B.
- DD. Pronotum obtusely angled.
  - E. Propleura with a black spot in both sexes..... *occidentalis* V. D.
  - EE. Female with the propleura unmarked.
    - F. Female from 5-6 mm. in length, males with a spot on propleura..... *viridis* Fh.
    - FF. Females less than 5 mm. in length, males with propleura unmarked..... *gleditschiae* O. & B.
- BB. Face spotted (spots sometimes obscure or wanting), species small, less than 4.5 mm. in length.
  - C. Five spots on the face in the male, species with dark markings on pronotum and scutellum, elytra with fuscous nervures..... *punctifrons* V. D.
  - CC. Two black bands, sometimes reduced to three spots, on face of male, species bright light green above without dark markings, elytral nervures indistinct..... *reversalis* O. & B.

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**PEDIOPSIS TRISTIS V. D. (Plate II., Fig. 3.)**

*Pediopsis tristis* V. D., Can. Ent., XXII., p. 249, 1890; Osborn, Proc. Ia. Acad. Sci., I., pt. 2, p. 126, 1892; Van Duzee, Cat., p. 260; Osborn & Ball, Davenport Acad. Sci., VII., p. 66, 1898.

Grayish brown above; yellowish green below; face with a black band above and a large black spot below. Length, ♀ 5.5 mm.; ♂, 4.75 mm.; width, 2 mm.

Pronotum, anterior margin a right angle, rugae strong, not curved, disc brown, an elongate impressed mark on the anterior margin just within either eye and a small spot outside of this black, most of the rugae and a semicircle on either side enclosing the black markings yellowish green. Scutellum yellowish green, a black triangle within either basal angle, disc brown in the male, elytra light brown, nervures light, heavily fuscous-margined, rendering them very distinct. Face yellowish green, a broad band extending nearly across the superior margin, running down as a point in the middle and emphasized as distinct spots above the ocelli, and a nearly circular spot

occupying the entire disc of the front, dark brown or black. Propleura unmarked or with a pale spot in some males, the triangular piece below marked in both sexes. Legs brownish, tibiae lined with fuscous.

Habitat, Ames and Fairfax, Iowa. Occurs on wild plum. Readily distinguished by the spots on the face and the distinct nervures.

PEDIOPSIS TRIMACULATA Fitch.

*Pediopsis trimaculata* Fitch. Homopt. N. Y., St. Cab., p. 60, 1851.

*Bythoscopus trimaculata* Walk. Homop. B. M., IV., 1162, 1852.

*Pediopsis insignis* V. D. Review, Ent. Am., V., 171, 1889; Can. Ent., XXII, p. 249, 1890; Cat., p. 260; Harrington, Ottawa Nat., VI., p. 31, 1892; Osborn, Proc. Ia. Acad. Sci., I., pt. II., p. 126, 1892.

Dull yellowish brown, sometimes blackish brown in the male, with three white spots in a row on each elytron, the anterior one sometimes obsolete. Length, ♀ 4.25; ♂, 4 mm; width, 1.50 mm.

Pronotum obtusely angled before, rugae fine but distinct, disc brownish, margins and rugae washed with yellowish green, scutellum brown, coarsely maculate with olive, a dark spot within either basal angle. Elytra dull brown in the female, dark brown in the male, nervures pale, a pale spot at the apex within the third and fourth apical cells, a longer one including the junction of the anteapical and basal cells and a third and much smaller one midway from the base, the latter sometimes obsolete.

Face and all below yellowish or yellowish green in the female, brown in the male, propleura marked in both sexes, obscured by the brown color in the male.

Habitat, Canada, New York, Michigan, Iowa, and Kansas.

This is undoubtedly the species that Dr. Fitch had in hand, the lighter colored females answering perfectly his short description. It occurs on the wild plum with the preceding from which it may be separated either as larva or adult by the absence of the black on the face. Fresh specimens have a powdery appearance resembling the bloom on the young stems of the plum.

PEDIOPSIS SORDIDA V. D.

*Pediopsis sordida*, V. D. [Can. Ent., XXVI, p. 89, 1894; Cat. p. 260; Gillette & Baker, Hemip. Colo., p. 73, 1895.]

Rusty brown, very variable in depth. Elytra with rusty brown

patches on a milky sub-hyaline ground in female, deep reddish brown in male. Length, ♀ 4.75–5 mm.; ♂, 4.50 mm.; width, 1.50 mm.

Pronotum obtusely angled before, rugae coarse, rather broken and somewhat curved around the polished area just inside either eye, these areas and sometimes the margins yellowish, disc rusty brown, scutellum very variably marked, often entirely brownish. Elytra longer in the female than in *trimaculata*, milky sub-hyaline, irregularly washed with rusty brown, deepest on the base; in the male of a deep nearly uniform reddish brown, face yellowish green sometimes washed with brownish, a spot on the propleura in the male often obscured by the brown color below.

This species has only been received from Colorado. It varies much in depth of color, sometimes even approaching *trimaculata* from which it may be readily distinguished by the longer and more pointed elytra and the absence of the light spots.

**PEDIOPSIS FERRUGINOIDES V. D. (Plate II., Fig. 4.)**

*Pediopsis ferruginoides* V. D., Review, Ent. Am., V., 181, 1889; Cat., p. 260; Osborn & Ball, Dav. Acad. Nat. Sci., VII, p. 66, 1898.

*Pediopsis bifasciata* Gillette & Baker. Hemip. Colo., p. 72, 1895.

Light or dark ferruginous, a transverse hyaline band on the elytra including the cross nervures at the bases of the anteapical cells. Length, ♀ 5.50–6 mm.; ♂, 5 mm.; width, 1.80 mm.

Pronotum nearly right-angled before, rugae coarse but rather shallow and inconspicuous, elytra rather long and narrow, apex acutely rounding. Color: face, pronotum and scutellum usually light ferruginous. Elytra usually a dark reddish brown, with the hyaline band in strong contrast. In some of the females the elytra are scarcely darker than the pronotum while in others and in most of the males the pronotum, excepting a light spot behind the eyes and the upper part of the face, are nearly as dark as the elytra, all below some shade of yellow, propleura usually with a large spot in both sexes.

Habitat, Montana, Colorado, Nebraska and Iowa. Occurs on the narrow-leaved willows, adults from the middle of June until the middle of July. The specimens from which the species was originally described were both of the lighter-colored females. The majority of the females, however, are much darker, as are all the males. The Colorado specimens reported as *bifasciata* were faded examples of this species.

## PEDIOPSIS CANADENSIS V. D.

*Pediopsis florescens* V. D. Review, Ent. Am., p. 173, 1889.

*Pediopsis canadensis* V. D. Can. Ent., XXII., p. 111, 1890.

Greenish or reddish yellow, elytra brownish with two light bands, one near the base, the other across the apex of clavus. Length, 4.75 mm.; width, 1.5 mm.

Pronotum obtusely angled, elytra broad, rounding at apex; color, greenish or reddish yellow on face, pronotum and scutellum. Elytra brownish with a narrow light band just back of the apex of scutellum, and a broader one across the apex of clavus.

Below, fulvous, propleura unmarked.

The types and two other specimens from New York show considerable variation in the depth of the brown color between the base and the first light band, and suggest that this may possibly be an extreme form of *bifasciata*, but the breadth of the elytra and the absence of black markings on the scutellum and propleura would seem to be sufficient to separate it.

Habitat, Canada and New York.

## PEDIOPSIS BIFASCIATA V. D.

*Pediopsis bifasciata* V. D. Review, Ent. Am., V., p. 173, 1889; Cat. p. 260.

*Pediopsis trimaculata* V. D. Review, Ent. Am., V., p. 172, 1889; Cat. p. 260; Harrington, Ottawa Nat., VI., p. 31, 1892.

Distinctly greenish or greenish brown with heavy fuscous or black markings in the basal angles of the scutellum, the basal half of the elytra, and again at the apex; males brownish with the elytra scarcely marked Length, ♀ 5.25 mm.; ♂, 4.50 mm.; width, 1.50 mm.

Vertex obtusely angled, thicker and more rounding than in *ferruginoides*. Pronotum greenish, washed with brown on the disc, often two fuscous marks on the anterior margins, rugae shallow, irregular, scutellum greenish, two spots just inside the basal angles fuscous, and two smaller round ones on the disc brown. Elytra: in the female whitish sub-hyaline, the costal margin greenish, a very variable amount of fuscous or black on the basal half, sometimes confined to the corium, often clear across, and again at the apex where it is usually in the form of a triangle, the apex in the anteapical cells; in the male the elytra are often brownish sub-hyaline and the fuscous markings

obscure, below greenish, the face and ovipositor washed with yellowish, propleura usually marked in both sexes, male pygofers with a distinct black spot on the sides.

Habitat, Canada, New York and Iowa. Occurs abundantly on the cottonwood, to which its color is well adapted, the males hiding in the cracks in the bark, while the females, being more distinctly green, conceal themselves at the base of the petioles.

Only possessing the two specimens of this species, one taken early and the other late, it is no wonder that the variation in color induced Van Duzee to consider them distinct, but a comparison of the types with a large series collected throughout the season show them to be ordinary variations of the same species.

They may be readily separated from *ferruginooides* by the shorter vertex and the distinct greenish cast.

#### PEDIOPSIS SUTURALIS O. & B.

Osborn & Ball, Dav. Acad. Nat. Sci., Vol. VII., p. 67, 1898.

Vertex right-angled, narrow; color, green with a stripe on either side of the pronotum and the entire clavus black. Length, ♀ 6 mm.; width 1.75 mm.; male smaller.

Pronotum sharply angled before, the rugae shallow, a black stripe arising just behind either eye, widening to the humeral margin, including the entire clavus, and extending as a narrow stripe around to the apex of the elytra, remainder of the body and elytra green, oviduct, pygofers, except at the apex, and parts of the face, washed with yellow.

Habitat, New York (V. D. Coll.), and Iowa. Occurs on willows. The black stripes which appear in even the smaller larvæ render this a strikingly distinct species. A heavily marked form of *basalis* might be mistaken for this species were it not for its much shorter and broader head.

#### PEDIOPSIS BASALIS V. D.

*Pediopsis basalis* V. D. Review, Ent. Am., V., p. 171, 1889; Cat., p. 260; Prov. Pet., Faune, Ent. Can., III., p. 295, 1890.

*Pediopsis fumipennis* G. & B. Hemip. Colorado, p. 73.

Female larger, head broad and blunt, green, the elytra sub-hyaline, washed with reddish brown, deepening into a fuscous band along the scutellar margin. Length, ♀ 5.5 mm.; width, 1.8 mm.

Pronotum only a little longer in the middle than across the humeral angle, rugae obscure. Pronotum, scutellum, costal margin of elytra, face and below, green, rest of the elytra and the basal angles of scutellum washed with brown, which is deepened on the base of the clavus into a more or less definite brownish fuscous band margining the scutellum; pygofer yellowish, green at tip; propleura unmarked.

Habitat, Canada, Iowa, Colorado. Occurs on cottonwood at Ames. This is a very distinct species on account of its broad, short vertex and large size. The male is not known. The difference in color seems to be due to localizations of the pigment; as the band becomes darker the brown disappears from the central part of the elytra.

#### PEDIOPSIS CROCEA O. & B.

*Pediopsis crocea* O. & B. *Dav. Acad. Nat. Sci.*, Vol. VII., p. '68, (Jan. 1898).

Bright saffron yellow, elytra clouded with brown, deepest on the clavus. Length, ♀ 5 mm.; width, 1.50 mm.; males smaller.

Pronotum obtusely angled before, much elevated behind, rugae coarse and distinct either side a median raised line. Face and pronotum bright saffron yellow; scutellum light yellow, the angles sometimes clouded with brown; elytra deep brown on the disc, fading to a broad yellowish costal margin, a saffron yellow line along the scutellar and humeral margins. Below light yellow, propleura unmarked.

Habitat, Lexington, Kentucky, on honey locust (Garman). This is quite distinct in all the specimens examined, the saffron yellow color remaining very constant and at once separating it from related forms.

#### PEDIOPSIS ERYTHROCEPHALA G. & B.

*Pediopsis erythrocephala* G. & B. *Hemip. Colorado*, p. 72.

Large, stout, vertex pointed, green varying to reddish orange on face and pronotum in female, brownish or slightly fuscous in male. Length, ♀ 5.75 mm.; ♂, 5 mm.; width, 1.8 mm.

Vertex triangular, pronotal rugae fine, obscure; color, green varying to orange on face, pronotum and scutellum in female; male greenish washed with brownish fuscous all over, usually a pair of fuscous spots behind each eye and another pair on base of scutellum just visible from under the pronotum; below yellowish or orange, propleura

with a large black spot in both sexes. Easily separated from the other green species by the larger size and much more pointed vertex as well as by the large spot on the propleura.

#### PEDIOPSIS OCCIDENTALIS V. D.

*Pediopsis occidentalis* Van Duzee. *Psyche*, V., p. 238, 1889.

Smaller, vertex obtuse, dull greenish yellow in the female, distinctly brownish in the male. Length, ♀ 5 mm.; ♂, 4 mm.

Vertex slightly rounder than in *viridis*, pronotal rugae distinct crescentiform. Elytra broader, apical cells shorter, general color darker, especially in males, propleura with a black spot in both sexes, much larger than in the male *viridis*.

Habitat, California, Nevada.

Van Duzee's "two small brown males from Nevada," mentioned under *viridis*, evidently belong here, and as placed, leaves quite a difference in depth of color, which, with the shorter vertex and larger spots on the propleura, makes this quite distinct from either *viridis* or *virescens* in the material at hand.

#### PEDIOPSIS VIRIDIS Fitch.

*Pediopsis viridis* Fitch. Homop. New York State; Cab., p. 59, 1851; id. reprint in Lintner's 9th Rept., p. 399, 1893; Uhler, Bull. U. S. Geol. and Geog. Surv., III., p. 467, 1877; Van Duzee, Can. Ent., XXI., p. 9, 1889; Ent. Am., V., p. 170, 1889; Prov. Pet., Faune, Ent. Can., III., p. 294, 1890; Van Duzee, *Psyche*, V., pp. 238, 388, 1890 (mention); Harrington, Ottawa, Nat., VI., p. 31, 1892 (mention); Osborn, Proc., Iowa Acad. Sci., I., pt. 2, p. 126, 1892 (mention).

Vertex slightly obtusely angled; color, green, males slightly washed with fuscous, the elytra brownish towards the apex. Length, ♀ 5.25 mm.; ♂, 4.85 mm.; width, 1.40 mm.

Female green, the elytra sub-hyaline greenish, slightly brown at the apex, male deep green, slightly washed with fuscous, the elytra distinctly brownish except on base and costa. Propleura with a small spot in males only, rarely wanting.

Habitat, Canada, New York, Iowa, Maryland, Kansas, Colorado.

This is the most common species on willow in Iowa as well as in the Eastern States; from *erythrocephala* it may be readily separated by the absence of the black spots on the female propleura and the fuscous

ones on the male pronotum, and from *reversalis*, the other one of the green, willow species, by the larger size and unmarked face.

Of the six anomalous examples mentioned by Van Duzee under the discussion of this species, the three green males were light-faced examples of *reversalis*, one female was a *suturalis*, and the two that "mimiced the males" were probably examples of *gleditschiae*. These being disposed of, the species is found to be fairly constant in the greenish females and brownish elytra in the males.

#### PEDIOPSIS GLEDITSCHIAE O. & B.

*Pediopsis gleditschiae* O. & B. Davenport Acad. Nat. Sci., VII., p. 62, (Jan., 1898).

Slightly shorter and stouter than *viridis*, green, the males with the elytra tinged with fuscous. Length, ♀ 4.75 mm.; ♂, 4-4.25 mm.; width, 1.20 mm.

Vertex angled about as in *viridis*, pronotum with distinct rugae, elytra stout, usually compressed behind; color, deep green; the females with the inner and apical margins of the elytra washed with brown, the males lightly washed with fuscous, deeper on the elytra, below green, the propleura unmarked in either sex.

Occurs on the honey locust in abundance at Ames, Iowa, the adults appearing before the middle of June. This species is much smaller and darker than *viridis*, the females being very similar to the males of that species in size and color, while the males are still smaller and darker, thus exhibiting the same general sexual variation as in the two preceding species.

The absence of the spot on the propleura will serve to separate them from all but the female *viridis*.

#### PEDIOPSIS PUNCTIFRONS V. D.

*Pediopsis punctifrons* V. D. Review, Ent. Am., V., p. 174, 1889; Cat., p. 260.

Light or yellowish green, elytral nervures distinct, black spots occurring on face, pronotum and scutellum. Length, ♀ 4 mm.; ♂, 3.50 mm.; width, 1.20 mm.

Face yellowish with five black points, one at the apex, another on each side directly above the ocelli, and a pair of comma-shaped ones

on the upper angles of the front. Pronotum with an elongate spot behind either eye, black, scutellum with the basal angles, two spots on the disc and a median longitudinal line sometimes interrupted, black, propleura with a distinct black spot in both sexes.

Habitat, Arizona. No new material in this distinct little species has been obtained, indicating that it is a more distinctly southern or western form.

The females are lighter colored than the males and in the lighter ones the spots are reduced in size.

#### PEDIOPSIS REVERSALIS O. & B.

Dav. Acad. Nat. Sci., VII., p. 69 (January, 1898).

Small, compact, light green, male with two heavy black bands on face, sometimes reduced to three spots. Length, ♀ 4.50 mm.; ♂, 4 mm.; width, scarcely more than 1 mm.

Vertex slightly more roundly obtuse than in *punctifrons*. Pronotum nearly smooth, rugae fine, obscure, the anterior pits obsolete; color, light green, the males with the elytra scarcely if at all darker than in the females; male face in the darker specimens with two broad black bands, one on the superior margin not quite reaching the eyes, and another between the antennal pits; in lighter specimens these bands may be reduced to three small spots, one at the apex and one on each superior angle of the front, propleura with a round black spot in the male.

Habitat, Iowa and New York. Occurs on the narrow-leaved willows.

Its small size and light green color, even in the males, will serve to distinguish it from all the other green species without reference to the marking on the face of the males.

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NOTE.—*Pediopsis nubila* V. D., from California, seems to be more closely related to the genus *Bythoscopus* in head characters than to this genus, and has been purposely omitted from the synopsis. The reticulate venation renders it a very distinct form in either genus.

## A REVIEW OF THE NORTH AMERICAN SPECIES OF IDIOCERUS.

BY HERBERT OSBORN AND ELMER D. BALL.

The members of this genus are easily recognized by their large size, broad, short heads, the eyes exceeding the pronotum in width, which in turn exceed that of the narrow apices of the folded elytra, giving the insects a wedge-shaped appearance.

The vertex is short and parallel-margined, rounding in front to the face, ocelli on the face between the eyes, just above the origin of the frontal sutures. The male antennæ usually bear a disc-like swelling near the tip; this is wanting, however, in a few of the European and a number of the American species. The elytra are usually longer than the abdomen and rather narrowly folded behind. There is but one transverse nervure between the sectors and that is often wanting in *cratigi*, four apical and three anteapical cells being the typical number. The elytra always possess a distinct appendix and the supernumerary cell is present in the wings.

Specific characters are found in the size and position of the spots on the vertex when present, in the size and shape of the outer anteapical cell, the shape of the facial pieces, the shape of the antennal discs of the male and the general size and color. The genitalia are of less classificatory value in this group than in most of the *Bythoscopidae*, the male organs presenting few variations that are available for use, their place being somewhat supplied, however, by the antennal discs.

In the female the shape of the last ventral segment and the length of the ovipositor are important characters in some cases.

The genus is widely and generally distributed throughout the North Temperate Zone. Europe has over thirty recognized species, and it is probable that that number will be reached in America when the fauna is better known.

The species of which the life histories are known are all exclusively tree-inhabiting forms in both larval and adult stages and are very limited in their range of trees, being confined to the different species of

*Salix*, *Populus* and *Crataegus*, the different species usually being confined to trees of a single genus and sometimes to a single species. The larvæ usually mimic the color of some part of the tree upon which they feed and are difficult to detect; they may be readily separated from those of other tree-inhabiting forms by their broad heads, prominent eyes and long roundingly tapering abdomens.

As far as known all the species are two-brooded, the adults hibernating and depositing eggs in spring. In the case of *alternatus* the eggs are placed near the tip of the younger twigs, usually several in a place, often causing distortion or death to the part.

#### SYNOPSIS OF THE SPECIES.

- A. Crest of the vertex with two round black spots about twice farther from each other than from eyes,

  - B. Spots on the vertex large, scarcely more than their own diameter from the eyes — species in which the head is very deep and the pronotum arched (male antennæ without discs).

    - C. Outer branch of first sector of elytra again forked, usually forming a triangular antecapital cell before curving away to the costal margin, species fulvous with light marking.

      - D. Clavus fulvous, usually a light stripe just outside the outer nervure, center of costa with a large black area. .... *maculipennis* Fh
      - DD. Clavus with the basal half creamy yellow, except a black line along the scutellar margin, center of costa scarcely darkened. .... *provancheri* V. D.

    - cc. Outer branch of first sector of elytra usually simple, sometimes an oblique nervure running to the costa. Species light gray with a pair of large, angular, black spots on each, pronotum and scutellum in line with those on the head. .... *crataegi* V. D.

  - BB. Spots on vertex small, two or more times their own diameter from the eyes.

    - C. Nervures of elytra not distinctly alternating in color, the outer fork of the outer branch of first sector usually curving away to the costa without forming an antecapital cell, or, at most, a small triangular one.

      - D. Species green, a dark line along the sutural margin of elytra, nervures indistinct (male antennæ without discs). .... *snowi* G. & B.
      - DD. Species brown, the elytra milky sub-hyaline with distinct tuberculate brown nervures (male antennæ with discs).

- E. Outer branch of first sector not forking again until some distance beyond its anastomosis with the inner branch, rarely forming a closed anteapical cell; face brownish fulvous without accessory markings. .... *brunneus* O. & B.
- EE. The outer branch of first sector forking at or before its juncture with the inner branch, often forming an anteapical cell; face yellow with accessory black markings ..... *lachrymalis* Fh.
- CC. Nervures of elytra usually alternately light and dark, the outer anteapical cell long and narrow.
- D. The cross nervure between the first and second sectors broadly white—male antennæ without discs. .... *moniliferæ*, O. & B.
- DD. The cross nervure of elytra not falling in a light band.
- E. Species 5 mm. long or over, dark colored. The face with six longitudinal stripes below, especially noticeable in the male; male antennæ with moderate discs at the end of longer filaments ..... *alternatus* Fitch.
- EE. Species smaller, not over 4.5 mm., lighter colored, face pale greenish or yellowish without stripes below, male antennæ with very large discs on filaments scarcely the length of the discs ..... *verticis* Say.

AA. Crest of the vertex without distinct round spots.

- B. Male antennæ without discs, species uniformly tawny or becoming darker, with transverse band on elytra.
- C. Species 5 mm. or under ..... *rufus* G. & B.
- CC. Species larger, over 5 mm. .... *mexicanus* n. sp.
- BB. Male antennæ with distinct discs, species greenish or with darker markings on the sutures.
- C. Species with distinct color markings on pronotum, scutellum or sutural margin of elytra.
- D. A dark stripe along the sutural margin of elytra often interrupted by a light crescent (male antennal discs elongate) ..... *suturalis* Fh.
- DD. Pronotum and scutellum more or less marked with fulvous fading out along the suture (male antennal discs nearly circular) ..... *amoemus* V. D.
- CC. Species nearly unicolorus, the scutellar angles rarely black.
- D. Size large (the largest in the genus), more than 5 mm. long.
- E. Elytra pale greenish, the outer fork of first sector forming a triangular anteapical cell before curving away to the costa, male antennal discs large .... *pallidus* Fitch.

EE. Elytra iridescent, yellowish, the tip darker, especially in male, the outer fork of first sector curving away to the costa without forming an antecapital cell; male antennal discs very small. *duzei* Prov.

DD. Size smaller, less than 5 mm., yellowish or greenish, the elytra hyaline, showing the dark nervures of the wings. .... *nervatus* V. D.

**IDIOCERUS MACULIPENNIS** Fitch. (Plate III., Fig. 4.)

*Idiocerus maculipennis* Fitch. Homop. N. Y. State Cab., p. 59, 1851.

*Bythoscopus maculipennis* Walk. Homop., IV., p. 1161, 1852.

*Idiocerus maculipennis* V. D. Psyche, V. p. 388; Osborn, Proc. Ia. Acad. Sci., I., pt. II., p. 126 (Iowa); Van Duzee, Trans. Am. Ent. Soc., XIX., p. 262.

Chestnut brown with narrow light stripes on pronotum, scutellum, and clavus. Length, ♀ 5.75 mm.; ♂, 5.25 mm.; width, 1.7 mm.

Face, in the female, chestnut with broad circles around the large black spots on vertex, and small crescents under the ocelli light yellow; in the male, yellow with a chestnut stripe down the middle and a darker one each side from the corner of the eye down the genæ outside the loræ. Pronotum chestnut with a pair of black spots on the anterior margin, the posterior margin and three spots on the disc light yellow, scutellum with the margins and tip light yellow. Elytra brownish, the nervures darker, a narrow light stripe on the outer margin of clavus, and a hyaline band crossing the apex and broadening towards the costa where it sharply interrupts the broad dark margin.

Head scarcely wider than the short convex pronotum but very deep. The outer antecapital cell short, triangular, the nervure then curving away to the costa. Ultimate ventral segment of the female with the posterior margin rounding, slightly emarginate in the middle; male valve with the posterior margin acutely triangular, the sides concave.

Found abundantly on hawthorn and crab apple, to which the chestnut brown color of both adult and larvæ are well adapted. Specimens are at hand from New York, Ontario, and Iowa.

**IDIOCERUS PROVANCHERI** V. D.

*Bythoscopus clitellarius* Prov. Pet. Faune Ent. Can., III., p. 288, 1890.

*Idiocerus provancheri* V. D. Can. Ent., XXII., p. 111, 1890; Osborn, Proc. Iowa Acad. Sci., I., pt. II., p. 126, 1892.

Fulvous brown, resembling *maculipennis*, but with a broad yellow stripe on the clavus. Length, ♀ 5.3 mm.; ♂, 5 mm.; width, 1.7 mm.

Face as in *maculipennis* in both sexes, pronotum lacking the black spots and the light margin, the two outer spots smaller, the middle one elongate; scutellum entirely rufus, darker in the male. Elytra fulvous brown, the nervures indistinct, scutellar margin black; just outside this to the margin of the clavus and extending back to just before the apex of the outer claval nervure where it rounds off is a distinct bright yellow area; costal margin with a hyaline spot before the tip.

Structurally very close to *maculipennis*, slightly smaller, readily distinguished by the bright yellow clavus.

Occurs, with the preceding, on the different species of *Crataegus*. Specimens are at hand from Canada, New York, Iowa, Colorado, and Van Couvers Island, B. C. Mr. Van Duzee has furnished records\* of its occurrence at Montreal, Winnipeg, and Hamilton (Jas. Johnson), Mt. Washington (Mrs. Slosson).

#### IDIOCERUS CRATAEGI V. D.

*Idiocerus crataegi* V. D. Can Ent., XXII., p. 110, 1890; Osborn & Ball, Ia. Acad. Sci., IV., p. 231.

Olive drab with six black spots in two rows. Length, ♀ 5.25 mm.; ♂, 4.75 mm.; width, 1.8 mm.

Face, pronotum and scutellum light greenish yellow, a pair of triangular black spots on the anterior margin of each pronotum and scutellum in line with those on the vertex, a small approximate pair on the disc of the scutellum, a pair beneath the ocelli and a pair of elongate ones beneath the antennæ, elytra olive brown, the nervures dark. Head much broader than in the preceding species, eyes prominent, face deep but more strongly curved than in either. Elytra without an antepical cell in the outer fork of the first sector and often without a transverse nervure between the sectors. Ultimate ventral segment of female nearly triangular, the apex slightly angularly emarginate. Ovipositor broad and short, male valve large, roundingly triangular, nearly half the length of the short, broad plates

Occurs on *Crataegus* appearing a little later in the season than the two preceding. Specimens are at hand from Canada, New York, Iowa and Colorado.

\* Kindly supplied from his notes, along with other records, included under other species.

## IDIOCERUS SNOWI G. &amp; B.

Hemiptera of Colorado, p. 79, 1895.

Pale green, elytral suture and two spots on vertex dark. Length, 5.25–7.5 mm.; width, 1.8 mm.

Face pale yellowish, two small round black spots on vertex, tip of clypeus bright green. Pronotum and scutellum unmarked. Elytra pale yellowish green, the apical nervures and margin slightly darker, a dark brown band along the sutural margin from the apex of scutellum to the apex of clavus. The costal nervure green. Legs and beneath yellowish, tarsi green.

Face short, rounding below; male antennæ not inflated; outer nervure of elytra forking at or before its juncture with the second, the outer branch forming a triangular anteapical cell, before curving away to the costa. Ultimate ventral segment of female moderately long, posterior margin with the corners rounded and the center emarginate; pygofers long, much exceeded by the attenuate ovipositor.

The dark marking on the suture is somewhat variable; when heavy this species resembles *suturalis*; when very pale, *pallidus*; but it is readily separated from either by the spot on the vertex, the simple antennæ in the male and the emarginate female segment.

Occurs on willows, apparently preferring the narrow-leaved varieties. Specimens are at hand from Iowa, Colorado and Ohio.

## IDIOCERUS BRUNNEUS O. &amp; B. (Plate III., Fig. 3.)

Proc. Davenport Acad. Nat. Sci., Vol. VII., p. 72. (Jan., 1898.)

Dull cinnamon brown, two black spots on the vertex. Broad with a depressed face. Length, 5.5 mm.; width, 2 mm.

Face tawny; a yellowish circle around the black spots and an interrupted line below; ocelli black; pronotum and scutellum cinnamon brown with lighter markings in the female, darker with black spots on scutellum in male. Elytra brownish sub hyaline with distinctly tuberculate dark brown nervures. Head broad, face much depressed, the front broad and convex, outer fork of first sector forking again some distance beyond the cross nervure, the outer branch curving away to the costa, rarely forming an anteapical cell.

Ultimate ventral segment in female very short, slightly produced and obsoletely notched in the middle; pygofers short, broad, only

slightly exceeded by the ovipositor; male valve roundingly pointed, plates broad and short; antennæ with small, slightly elongate discs.

Occurs on willows. Specimens are at hand from Iowa, Nebraska and Colorado. The short, broad form and cinnamon color will readily separate this species from any other.

#### IDIOCERUS LACHRYMALIS Fitch.

*Idiocerus lachrymalis* Fitch. Homop. N. Y. State Cab., p. 58, 1851; id. reprint in Lintner's 9th Rept., p. 308, 1803; Van Duzee, Can. Ent., XXI, p. 8, 1889; Psyche, V., p. 388, 1890; G. & B., Hemip. Colo., p. 76, 1895.

*Bythoscopus lachrymalis* Walk. Homop., IV., p. 1161, 1851.

Large, pale, yellowish, washed with brown, a large spot against either eye and a line between the two spots on the vertex, dark brown. Length, ♀ 7 mm.; ♂, 5.5 mm.; width, ♀ 2 mm.; ♂, 1.5 mm.

Face yellow, usually a large triangular spot against either eye, a smaller one on the front just within and below either ocellus and a band between the two spots on vertex, dark brown. Pronotum pale yellowish, milky posteriorly, more or less marked with darker. Elytra milky white, the nervures distinct, dark brown, outer antecapital cell very variable in size, often wanting. Ultimate ventral segment of the female strongly medially produced; male antennal discs large, twice longer than wide.

Mr. Van Duzee notes it from Franconia and Mt. Washington, N. H. (Mrs. Slosson), Mountains of Northwestern Colorado (Gillette.)

Specimens are at hand from Ontario, New York, and Colorado. This is a very variable species both in size and coloration and has been confused with several other species. When the spots on the face are present they will readily separate it from any other species; when wanting, as is often the case in the male, the short or wanting antecapital cell, the produced female segment, and the long nearly parallel-sided disc of the male antennæ will serve to readily separate it.

The *I. productus* of G. & B., on examination of a type, proved to be founded on nothing but a pair of crushed specimens of the above species, the "remarkable form of the head" being due to the vertex having been pushed forward and crushed along a middle line—probably when the specimens were very fresh, as the coloring matter had somewhat segregated into the crushed area, but not forming a distinctly bounded black spot as shown in the cut accompanying the description.

## IDIOCERUS MONILIFERÆ O. &amp; B. (Plate III., Fig. 2.)

*Idiocerus monilifera* Osborn & Ball. Proc., Davenport Acad. Nat. Sci., Vol. VII., p. 71 (Jan., 1898).

*Idiocerus monilifera* Osborn. Proc., Ia. Acad. Sci., Vol. V., p. 233.

Broader than *alternatus*, brownish with light markings, face with a broad dark band, cross nervure of elytra white. Length, 5 50 mm.; width, 2 mm.

Face yellowish, a broad transverse black band between the ocelli and the spots on the vertex, this band produced downward against the eyes and sending a slender line towards the antennal pits. Front very broad, rounding away from the antennæ, a brownish band either side just inside the margin, arching across just below the antennal pits. Pronotum irrorate with fuscous except on a median line. Elytra sub-hyaline with the nervures alternately dark and light. The bases of all the nervures light, the cross nervure between the sectors broadly light. Ultimate ventral segment of female broadly rounding and shallowly notched in the middle, male plates very broad and short, antennæ without discs.

Found on cottonwood at Ames, Iowa.

## IDIOCERUS ALTERNATUS Fitch. (Plate III., Fig. 1.)

*Idiocerus alternatus* Fitch. Homop. N. Y. State Cab., p. 59, 1851.

*Bythoscopus alternatus* Walk. Homop., III, p. 876, 1851.

*Idiocerus alternatus* V. D. Can. Ent., XXI., p. 8, 1889. Psyche, V., p. 388. Provancher, Pet. Fauna Ent. Can., III, p. 293. Harrington, Ottawa Nat., VI, p. 31. Osborn, Proc. Ia. Acad. Sci., I, pt. II., p. 126. Cockerell, Trans. Am. Ent. Soc., XX, p. 365; G. & B. Hemip. Colo., p. 73, 1895.

*Idiocerus interruptus* G. & B. Hemipt. Colo., p. 74, 1895.

Brownish fuscous alternating with white on pronotum and elytra. Face yellowish, usually a fuscous arc outside the two black spots. Length, ♀ 5.25 mm.; ♂, 5 mm.; width, 1.5 mm.

Face yellowish, irregularly mottled in the female, four stripes on the lower part in the male, usually a brownish crescent outside the round spots on vertex. Pronotum brownish, a light stripe on the middle extending on to the vertex and back across the scutellum: scutellum with the broad basal angles and two spots on the disc separated by a bifid brownish line, black. Elytra sub-hyaline, the nervures fuscous interrupted with white, the second sector with several short interrup-

tions before the transverse nervures, a large circular light spot covering the tips of the outer claval nervures and a smaller one at the apex of clavus. Ultimate ventral segment of female short, nearly truncate, the corners rounding; male plates long and narrow; antennal discs nearly circular.

Occurs abundantly on willows over a very wide area. The adults that hibernate are usually much darker than those of the summer brood. In some sections these have a distinctly rufus cast.

Specimens are at hand from Ontario, New York, Iowa and Colorado. Van Duzee has records of its occurrence in Ottawa, Canada, (Harrington), Ag. Coll. Mich. (G. C. Davis), Quebec (Provancher), California (Coquillett), Franconia, N. H. (Mrs. Slosson). An examination of two of the types of *interruptus*, through the kindness of Prof. Gillette, showed no character by which they could be separated from typical *alternatus*.

#### IDIOCERUS VERTICIS Say.

*Jassus verticis* Say. Jour. Acad. Nat. Sci., Phila., VI., p. 308, 1831.

*Bythoscopus verticis* Uhler. Bull. U. S. Geol. and Geog. Surv., III., p. 465, 1877.

*Idiocerus verticis* Van Duzee. Psyche, V., p. 389, 1890; G. & B., Hemip. Colo., p. 80, 1895.

Pale brownish fading to nearly white, except the black spots on vertex and scutellum. Elytra pale brownish, broadly interrupted with light. Length, ♀ 4.5 mm.; ♂, 4.25 mm.; width, 1.10 mm.

Face and all below creamy or greenish yellow; ocelli and spots on the disc black. Pronotum light, washed with brownish, a few oblique dark spots on the anterior part of the disc; scutellum yellowish, basal angles black, tip white. Elytra white, washed with pale brownish, nervures brownish interrupted with white, inner sector with a single long interruption before the transverse nervure, suture with a light spot in the middle. Ultimate ventral segment of female short, truncate; pygofers rather long and narrow, exceeded by the ovipositor, male plate long and slender, antennæ short, with a very large disc which scarcely reaches the clypeus.

Missouri (Say), Denver, Colo. (Uhler).

Found at Ames, Iowa, on willows along with the preceding species, which it most resembles. It is usually of a lighter color, often nearly white. Its smaller size, lighter color, and shorter ovipositor in the

female will separate it from the preceding species, while the immense discs on the short antennæ render it a strikingly distinct species whatever its color.

In the pale examples the spots on vertex and scutellum are very distinct but in the more heavily irrorate examples they are obscured, while the white markings are very distinct. Thus answering Say's description.

It is probable that many of the references to this species also included *alternatus*.

#### IDIOCERUS RUFUS G. & B.

Hemiptera of Colorado, p. 80.

Reddish brown, face yellowish, elytra showing alternate light and dark nervures except in the reddest specimens. Length, 5 mm.; width, 1.5 mm.

Face light creamy yellowish, scarcely marked, ocelli brown, pronotum chestnut, a narrow light line and a pale spot either side on the disc, elytra sub-hyaline, the nervures obscured in the redder forms, alternately light marked in the darker ones, pattern of marking similar to *moniliferæ*. Ultimate ventral segment rounding, the center slightly excavated, male plate small, the styles broad and stout, antennæ without discs.

Found on cottonwood at Ft. Collins, Colorado, by Prof. Gillette, through whom the specimens were received. This species was described from two extremely rufus specimens. The majority of the specimens received were darker and showed the light markings on the elytra. The darker forms somewhat resemble *moniliferæ* but all those examined are smaller the face is narrow and lacks the characteristic dark band of that species.

#### IDIOCERUS MEXICANUS n. sp.

Cinnamon brown, scutellum of a brighter rufous color. Resembles *rufus* but is considerably larger. Length, ♀ 6 mm.; ♂, 5.75 mm.; width, 2 mm.

Head broad, vertex fairly broad, occiput and front nearly parallel, face rather long, triangular, obtusely pointed below, genæ with very straight margins; front and loræ distinctly tumid. Pronotum, width twice the length, posterior margin scarcely emarginate. Elytral veins distinct but not prominent, not tuberculate.

Color: head, pronotum, elytra, tergum, and touches on under surface and legs, cinnamon brown. The lower part of the face inclines to yellowish and the pronotum and scutellum have irrorations of this color, while the propleura, margins of tergum, the venter and femora are yellow or light stramineous.

Genitalia: Last ventral segment of female scarcely longer than preceding, pygofer broad, rugose or gibbous posteriorly, exceeded by the ovipositor. Male valve short, obtusely rounded behind; plates narrow, finely ciliate.

Described from one female and one male collected by Prof. C. H. T. Townsend, Jicaltepec, Vera Cruz, Mexico, 1896.

This species is marked by the large size, tumid front and loræ, and, for the specimens in hand, by the distinct cinnamon brown color.

#### IDIOCERUS SUTURALIS Fitch.

*Idiocerus suturalis* Fitch. Homop., N. Y. State Cab., p. 59, 1851.

*Bythoscopus suturalis* Walk. Homop., IV., p. 1162, 1852.

*Idiocerus suturalis* Van Duzee. Canada Ent., XXI., p. 8; Psyche, V., p. 388; Cat., 261; Gillette & Baker, Hemip., Colo., p. 80.

Pale yellowish, a dark brown stripe along the suture, elytral nervures indistinct. Length, ♀ 5.75 mm.; ♂, 5 mm.; width, 1.50 mm.

Face rather long, genæ nearly straight-margined below; clypeus much expanded just before apex which extends below the genæ. Face and all beneath yellowish. Elytra yellowish hyaline, the apex dusky, sutural margins broadly marked with brown, sometimes interrupted by a white crescent, often continuing on to the scutellum and the posterior part of the pronotal disc, outer anteapical cell broad, triangular, the nervure curving away to the margin. Ultimate ventral segment of the female about three times wider than long, posterior margin with a roundly produced median lobe; male antennal disc elongate.

Specimens are at hand from New York and Colorado. Mr. Van Duzee has records of its occurrence for Ag. Coll., Mich. (G. C. Davis), Douglass Co., Kas. (F. H. Snow), Mt. Washington (Mrs. Slosson), Winnipeg (Jas. Fletcher).

This is a somewhat variable species. Those with the darker interrupted stripe are mostly males, though occasionally a female is found.

Van Duzee reports it from willow, poplar and birch.

## IDIOCERUS AMÆMUS V. D.

*Idiocerus amæmus* Van Duzee. Can. Ent., XXVI., p. 89, 1894; Cat., p. 261.

Greenish, elytra hyaline, pronotum and scutellum olive or fulvous brown. Length, ♀ 5 mm.; ♂ 4.5 mm.; width, 1.5 mm.

Face shorter than in *suturalis*, genæ decidedly convex, reaching the tip of the clypeus. Clypeus widest at apex, the side margins straight. Face unicolorous, yellowish green in the female, two brown stripes below in the male. Pronotum olive brown, washed with fulvous, often marked with lighter. Elytra hyaline, allowing the dark nervures and the green tergum to be seen, outer antecapital cell moderately long. Ultimate ventral segment of the female short, feebly rounded behind, the outer angles obsolete. Male antennal disc moderately large, nearly round.

Occurs on willows. So far specimens have only been received from Colorado and California.

## IDIOCERUS PALLIDUS Fitch.

*Idiocerus pallidus* Fitch. Homop., N. Y. State Cab., p. 59, 1851.

*Bythoscopus pallidus* Walker. Homop., IV., p. 1162.

*Idiocerus unicolor* Osborn. Proc. Iowa Acad. Sci., I., pt. II., p. 12, 1892.

*Idiocerus obsoletus* Walker. Homop., III., p. 873, 1851.

Large, pale greenish, eyes reddish. Length, ♀ 6.5 mm.; ♂, 6 mm.; width, 2 mm.

Face and all beneath pale greenish; eyes reddish brown; pronotum greenish; scutellum greenish; rarely with dark markings on the angles. Elytra greenish, sub-hyaline, nervures indistinct, occasionally the elytra are hyaline showing the dark nervures of the under wing.

Tergum greenish, rarely in dark specimens blackish, a very broad, stout species. The outer antecapital cell long, triangular, rarely wanting. Ultimate ventral segment of female short, posterior margin medially produced into a broad, rounding lobe; pygofer scarcely inflated, exceeded by the stout ovipositor, by the length of the ventral segment; male antennal discs oblong, moderately large.

This is a wide-spread and abundant species occurring on willows. Specimens are at hand from New York, Iowa and Colorado, and it

has been taken for Quebec (Provancher), Ottawa (Harrington), Clear Creek Canon and Denver (Uhler), Philadelphia (C. W. Johnson).

An examination, by the senior author, of Walker's type of *obsoletus* from "Hudson Bay," led to the belief that it should be referred to this species.

#### IDIOCERUS DUZEI Prov.

*Idiocerus duzei* Prov. Pet. Faune, Ent. Can., III., p. 292, 1890.

*Idiocerus perplexus* G. & B. Hemip. Colo.

*Idiocerus pallidus* var. Bak. Ent. News, Vol. VIII., p. 54.

Slightly larger than *pallidus*, light yellowish green, the elytra golden iridescent, tipped with fuscous. Length, ♀ 7 mm.; ♂, 6 mm.; width, 2 mm.

Face and below pale greenish white, pronotum greenish, fading out posteriorly; scutellum yellowish, sometimes marked with brown, the tip greenish. Elytra yellowish green at base, sub-hyaline with a golden reflection beyond, becoming smoky at the tip in the female and strongly fuscous in the male; tergum yellowish, sometimes fuscous on the disc. A still broader and stouter-appearing species than the preceding, with longer elytra, the outer branch of the first sector not forming an anteapical cell, or rarely a short triangular one, the outer nervure curving away to the costa. Ultimate ventral segment a little longer than in *pallidus*, the outer angles rounding; pygofer broader, the ovipositor exserted less than the length of the segment, male antennal disc smaller, less than three times the width of the filament.

The specimen from which Provancher described this species was determined as new for America by Prof. Van Duzee, who also determined two other specimens of this species, one from New Hampshire and one from Michigan. These specimens are somewhat darker than most of the Iowa and Colorado ones, but they agree in all the structural details.

*Idiocerus perplexus* G. & B. was stated to be only a variety of *pallidus* by Baker (Ent. News, Vol. VIII., No. 3, p. 54). An examination of the types, however, show it to be quite distinct from that species but identical with the above.

Found only on the cottonwood at Ames, Iowa. Specimens are at hand from New Hampshire, Michigan and Colorado. Records from Mr. Van Duzee are: Franconia, N. H. (Mrs. Slosson), Ag. Coll. Mich. (G. C. Davis), Quebec (Provancher).

## IDIOCERUS NERVATUS V. D.

Bulletin Buffalo Soc. Nat. Sci., V., pt. 4, 1894 (No. 1); Cat., p. 261.

Small, stout, pale green or yellowish, the oblique dark nervures of the under wings showing through the hyaline elytra. Length, ♀ 4.75 mm.; ♂, 4.50 mm.; width, 1.20 mm.

Pale yellowish green, tarsi light green, elytra hyaline, the nervures of the under wing showing distinctly above the green abdomen, outer anteaipical cell long, as in *alternatus* and *verticis*. Ultimate ventral segment of female scarcely wider than long, posterior margin nearly truncate; male antennal discs small, nearly circular.

Occurs on willows throughout the greater part of the United States, though rarely in very great numbers. Specimens are at hand from New York, New Jersey, Michigan, Iowa, Colorado and Arizona. A very distinct little species, although other species often show the nerve character. It can be readily separated from *pallidus*, which it most closely resembles, by the smaller size and the long, nearly truncate, segment of the female.

## UNKNOWN SPECIES.

## IDIOCERUS RAMENTOSUS Uhler.

*Bythoscopuss ramentosus* Uhler. Bull. U. S. Geol. and Geog. Surv., III., p. 465, 1877.

*Idiocerus ramentosus* Van Duzee. Psyche, V., p. 389, 1890. Cat., p. 262; Gillette & Baker, Hemip. Colo., p. 79.

*Idiocerus inscriptus* Uhler, in litt. (vide Van Duzee).

As described, this species should be "pale testaceous more or less clouded with rust brown and fulvous," "vertex with a round black spot each side, and a smaller black dot each side interior to the ocelli; face sometimes irregularly marked with small brown spots and lines, those above being arranged transversely and those below in a horse-shoe arc."

Specimens of both *lachrymalis* and *alternatus* have been received labeled *ramentosus* and it is probable that most of the references for this species should be credited to one or the other of these.

Some of the darker specimens of *rufus* show traces of black spots on the vertex and answer the description fairly well except for the face markings. If specimens are found with these also it is possible that

*ramentosus* will be found to occur on cottonwoods instead of willows, as described, and include both *rufus* and *moniliferae*, although the material now at hand will not warrant such a conclusion.

**IDIOCERUS STRIOLA** Fieb.

*Idiocerus striola* Fieb. Verh. zool-bot., Gesell. Wien, XVIII., p. 453. 1868; Van Duzee, Cat., p. 262.

This was originally described by Fieber as a European species in 1868, and so listed in his catalogue, 1872, crediting it to "Sithka"\*\* each time. It is evidently another of the alternate veined series and may well be *alternatus* of Fitch, as that species is already known to be widely distributed and the darker specimens, such as would be expected to occur in such high latitude, answer the short description.

*Idiocerus distinctus* G. & B. Hemipt. Colorado, p. 75.

The description of this species was drawn up from a single female and is wanting in several essential points, so that without an examination of the type, which unfortunately has disappeared from the Colorado collection, it can not be accurately placed.

Steamboat Spring, Colo., on willow (G. & B.).

*Idiocerus mimicus* G. & B. Hemipt, Colorado, p. 76.

The type of this species is also lacking from the Colorado collection, which is still more unfortunate, as there is a discrepancy between the description and the figure that accompanies it; the description giving the pronotum as unicolorous, while the figure shows four large black spots on the disc.

Fort Collins, Colorado, on black walnut (G. & B.).

\*\* "Sithka" (Fieber), "Sitka" (V. D. in Catalogue).

## CONTRIBUTIONS TO THE ENTOMOLOGY OF NEW MEXICO.

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### I. A CATALOGUE OF THE FOSSORIAL HYMENOPTERA OF NEW MEXICO.

#### MUTILLIDÆ.

This family is at present being revised by Mr. Fox, who will treat of several new or little-known species found in New Mexico, but here omitted.

*Mutilla sanctæ-fæcæ*, Ckll. & Fox — Santa Fé.

*Ephuta virguncula*, Blake, is reported from New Mexico; *E. californica*, Rad., *E. bioculata*, Cress., and *E. fulvohirta*, Cress., were taken by Dr. S. Lewis in 1867.

*E. bexar*, Blake — Continental Divide, Tenaja and Chaves (Townsend).

*E. occidentalis*, L. — Continental Divide, Tenaja (Townsend).

*E. macra*, Cress., det. Fox — Chaves, one ♂ (Townsend).

*E. californica*, Rad. — Santa Fé. The beautiful var. *euchroa*, Ckll., occurs at Coolidge and Embudo.

*E. ægina*, Cress., det. Fox — Santa Fé, August (Edw. L'Engle). I think this Santa Fé insect should be called *E. bellona*, Cress., of which *ægina* is probably a variety.

*E. townsendi*, Ckll. — Mr. Fox has referred to this species a specimen from Santa Fé (*V. Boyle*), and as a variety, one from Albuquerque, June 30 (Ckll.). They seemed to me hardly typical of *townsendi*.

*E. contumax*, Cress., det. Fox — Santa Fé, July 30.

*E. propinqua*, Cress., det. Fox — La Tenaja near Santa Fé, Aug., 1895 (*Myrtle Boyle*).

*E. snoworum*, Ckll. & Fox — Albuquerque (*Snow*).

*E. coccineohirta*, Blake, det. Fox — Santa Fé, Aug. 5; and rather common in the Mesilla Valley. The specimens are not typical in coloration.

*E. creusa*, Cress — Mesilla Valley, rather common.

*E. gloriosa* subsp. *pseudopappus*, Ckll. — Not rare in the Mesilla Valley. Grant County (*Howard*).

*E. gorgon*, Blake — Mesilla Park, not rare.

*E. scævolella*, Ckll. & Casad — Mesilla Valley, rare.

*E. foxi*, Ckll. — Very common in Mesilla. The female was described as *S. heteroshora*, Ckll. & Casad, and is found with males which differ only a little, and that in color, from the original males of *foxi* from Mexico.

*E. marpesia*, Blake — Las Cruces, rare.

*E. orcus*, Cress. — Very common in the Mesilla Valley.

*E. mixtura*, Blake, det. Fox — Mesilla Park, on campus of Agricultural College, Sept. 16.

*E. donæ-anæ*, Ckll. & Fox — Mesilla Valley, rather common.

*E. vesta*, Cress., det. Fox — Mesilla, Sept. 3.

*Chyphotes elevatus*, Blake — Santa Fé.

*C. picus*, Ckll. — Santa Fé and Mesilla Valley. Perhaps the ♂ of *elevatus*.

*C. belfragei*, Blake, and var. *melaniceps*, Blake — Mesilla Valley.

*C. peculiaris*, Cress. (*mirabilis*, Ckll.) — Mesilla Park.

*Photopsis territus*, Ckll., *P. nubecula*, Cress., *P. astyanax*, Blake, *P. concolor*, Cress., *P. danaus*, Blake, *P. clara*, Blake, var. *P. tapajos*, Blake, and *P. mesillensis*, Ckll., all come to light in the Mesilla Valley. The last two were taken at Mesilla.

*P. nokomis*, Blake, det. Fox — Santa Fé.

*Brachycistis castaneus*, Cress., *B. glabrellus*, Cress., *B. perpunctatus*, Ckll., *B. lepidus*, Blake, *B. idiotes*, Ckll., and *B. elegantulus*, Ckll. & Casad, all occur in the Mesilla Valley.

*Methoca stygia*, Say, det. Ashm. — Mesilla, June 26.

## PHILANTHIDÆ.

*Philanthus ventilabris* var. *frontalis*, Cress., and *P. henricus*, Dunn, were taken by Townsend on the Gila River.

*P. ventilabris*, Fab.—Socorro, June 29. Var. *frontalis*, Cress., Mesilla Valley.

*E. punctatus*, Say, var. *cockerelli*, Dunn.—Common in the Mesilla Valley. At Rincon, July 5, at flowers of *Chilopsis linearis*, I took a form with rufous femora. This same form, which may be named *f. chilopsisidis*, also occurred in Las Cruces, June 5, at flowers of *Chilopsis linearis*, one ♀. Another ♀, taken with the last-mentioned, has the femora basally black and apically rufescent.

*P. pacificus*, Cress.—Mesilla Valley, not rare.

*P. annæ*, Dunn.—Mesilla Valley. The specimen so referred by Dunning, from Las Cruces, was perhaps *multimaculatus*.

*P. multimaculatus*, Cam.—Mesilla Valley, rather rare.

*P. cleomæ*, Dunn.—Mesilla Valley; campus of Agricultural College, Sept. 5, on *Isocoma wrightii*.

*P. gloriosus*, Cress.—Mesilla Park, Oct. 11, 1893. (Agnes Williams.)

*P. scelestus*, Cress., det. Dunn.—Santa Fé, Aug. 5.

*P. psyche*, Dunn.—Mesilla Valley.

*P. albopilosus*, Cress., det. Fox—Las Cruces, Aug. 24, on *Solidago canadensis* subsp. *arizonica*.

*Aphilanthops quadrimaculatus*, Ashm., *A. taurulus*, Ckll., and *A. lati-cinctus*, Cress., occurs in the Mesilla Valley. The second is found also at Rincon, and the third at Santa Fé.

*A. concinnulus*, Ckll.—Rincon Mr. Dunning has referred the ♀ of this to *utahensis*, Baker, but I feel certain it is distinct, and belongs with the males found associated with it.

*Eucereris zonatus*, Say—Las Cruces (Townsend).

*E. canaliculatus*, Say—Las Cruces (Townsend).

*E. montanus*, Cress.—Las Cruces (Townsend).

*E. vittatifrons*, Cress., var. *tricolor*, Ckll., was described from the Mesilla Valley.

*E. fulviceps*, Cress., was described from New Mexico.

*Cerceris acanthophilus*, Ckll.—Mesilla Valley; Deming. Mr. Fox formerly referred a Mesilla Valley example to *C. finitima*, Cress., but it was probably *acanthophilus*.

*C. venator*, Cress.—Las Cruces and El Rito (*Townsend*).

*C. bicornuta*, Guér.—Recorded by Townsend from Vega S. José.

*C. frontata*, Say—Vega S. José (*Townsend*).

Some other N. M. Philanthidæ still await study.

#### BEMBECIDÆ.

*Sphecius speciosus* var. *grandis*, Say—Common in the Mesilla Valley.

*Stizus flavus*, Cam., var. *subalpinus*, n. var.—♂. Differs from the type, as described by Cameron, by having the fuscous pubescence of the head and thorax paler and scant, in fact scarcely noticeable, and the black markings much reduced, so that the abdomen may even become immaculate yellow above; while the hind tibia has no black streak.

*Hab.*—Santa Fé, N. M., at flowers of an unbellifer in July. (Ckll.)

*Stizus godmani*, Cam., and *S. unicinctus*, Say—See Bull. 15, N. M. Agr. Exp. Sta., p. 65.

*Bembidula capnoptera*, Handl., var. *mesillensis*, n. var.—♂. Legs black and yellow, instead of ferruginous, the black including much of the basal halves of the femora, the tibiæ and tarsi wholly yellow. Wings with a strong fuscous stain immediately basad of the marginal cell, suffused in all directions, but otherwise nearly clear.

*Hab.*—Las Cruces, N. M., probably collected by Prof. C. H. T. Townsend.

*B. variegata*, Oliv.—Fox reports a specimen in Coll. Ashmead, from Albuquerque. It was doubtless collected by Wickham, though this is not stated.

*Bembex similans*, Fox, and *B. occidentalis*, Fox—See Fox, Proc. Phila. Acad., 1895, pp. 359-362.

*B. spinolæ*, Lep.—Santa Fé, July 10. (*Boyle*); det. Fox.

*Microbembex monodonta*, Say—Common in the Mesilla Valley; also taken at Albuquerque.

*Monedula pulchella*, Cress., det. Fox—Las Cruces, June 13, preying on *Lycæna marina*, Reak.

*M. speciosa*, Cress., det. Ashm.—Mesilla, June 26.

*Steniolia duplicata* Prov.—Common in the Mesilla Valley.

## NYSSONIDÆ.

*Nysson texanus*, Cress., is common, and *N. solani*, Ckll., rare, in the Mesilla Valley.

*Gorytes pygidialis*, Fox, *G. bigeloviae*, Ckll. & Fox, and *G. crucis*, Ckll. & Fox, were described from the Mesilla Valley.

*G. propinquus*, Cress., and *G. tricolor*, Cress., were described from specimens collected by Dr. S. Lewis in northern New Mexico in 1867. I have taken *G. tricolor* at La Junta, Colorado.

*G. venustus*, Cress.—Santa Fé, see Bull. 15, N. M. Agr. Exp. Sta., p. 63.

*G. spilopterus*, Handl.—Organ, N. M., 5100 ft., Sept. 28, 1896.

*G. bipunctatus*, Say, det. Fox—Common in the Mesilla Valley. Once at Santa Fé, on a hop vine.

*G. hamatus*, Handl.—One (det. Fox) coll. by Elgin Holt at Las Cruces, May, 1896.

*G. eximus*, Prov., det. Fox—On *Bigelovia* in the Mesilla Valley.

*G. monedulaoides*, Pack., det. Fox—Mesilla Valley in August.

*G. phaleratus*, Say—Mesilla, June 7, etc.

## LARRIDÆ.

*Trypoxyylon texense*, Sauss., and what I take to be *T. tridentatum*, Pack., occur in the Mesilla Valley, the former being very common. *T. texense* was found also at Vega S. José (Townsend).

*Notogonia argentata*, Bve., is common in the Mesilla Valley.

*Ancistromma chilopsisidis*, Ckll. & Fox, was described from Rincon; *A. rugosa*, Fox, is reported from New Mexico, but the locality of capture is unknown. It was probably taken by Wickham.

*Tachytes distinctus*, Sm.—Common in the Mesilla Valley.

*T. exornatus*, Fox—Mesilla Valley; also at Colora'o, near Rincon.

*T. spatulatus*, Fox—Santa Fé, see Bull. 15, N. M. Agr. Exp. Sta., p. 74.

*T. fulviventris*, Cress., is recorded by Townsend from Chaves and Sabinal; and *T. abdominalis*, Say, was taken by Dr. S. Lewis in 1867.

*Tachysphex amplus*, Fox, is recorded by Fox vaguely from "New Mexico."

*T. fusus*, Fox, was partly based on Mesilla Valley material.

*T. terminatus*, Smith — Mesilla Valley; the first specimen was collected by Mr. F. Garcia.

*Plenoculus cockerelli*, Fox — Common in the Mesilla Valley; also taken at Rincon.

*P. parvus*, Fox — The type specimen was taken at Las Cruces early in September.

*P. propinquus*, Fox, var. *rufescens*, n. var. — Basal portion of abdomen suffused with reddish. Santa Fé, N. M., Aug. 8 (*Myrtle Boyle*).

*Astatus bigeloviae*, Ckll. & Fox, was described from the Mesilla Valley.

*A. nevadicus*, Cress. — Santa Fé, July 28, 1895. Mesilla, on *Solanum elaeagnifolium*, Aug. 25, 1896. The Mesilla insect I thought distinct, but Mr. Fox refers it to *nevadicus*.

*A. elegans*, Cress., det. Fox — Santa Fé and the Mesilla Valley.

*A. bicolor*, Say, det. Fox — Mesilla Valley (*Clarence Rhodes*); also Santa Fé.

*A. bellus*, Cress., det. Fox — Mesilla Valley, on *Bigelovia*.

*A. nubeculus*, var. *nigropilosus*, Cress., det. Fox — Mesilla Valley.

*A. asper*, Fox, det. Fox — Mesilla Valley (*Clarence Rhodes*).

*Miscophinus arenarum* (Ckll.) — Mesilla Park.

#### SAPYGIDÆ.

*Sapyga pumila*, Cress., det. Fox — Santa Fé, July 7.

#### SCOLIIDÆ.

*Tiphia* — We have one or more species, not yet studied.

*Paratiphia albilabris*, Lep. — Common in the Mesilla Valley; also taken at Albuquerque.

*Myzine frontalis*, Cress. MS., det. Fox — Rincon and the Mesilla Valley. This is a ♀ *Myzine* about 13 mm. long, black and yellow, with hyaline wings. Legs black, hind tibiae slightly rufescent; abdomen shiny; thorax with yellow marks; head above with a black triangle enclosed in a yellow one.

*M. confluens*, Cress., det. Fox — Rincon, July 6, on *Baccharis*.

*M. hamata*, Say, det. Fox—Colora'o, near Rincon, July 11, at flowers of *Koeberlinia spinosa*, Zucc.

*M. hyalina*, Cress.—Common in the Mesilla Valley; on June 14, I found the males flying in a swarm, in great numbers.

*Scolia flavocostalis*, Cress., and *S. lecontei*, Cress., were taken by Dr. S. Lewis in 1867.

*S. lecontei*, Cress., *S. dubia*, Say, and *S. dubia*, var. *haematoches*, Burm., are recorded by Townsend from Vega S. José.

*S. ridingsii*, Cress., det. Ashm., was taken behind the Agricultural College, Mesilla Valley, June 27, on mesquite.

We have also two doubtful species of *Scolia*; one, from Lone Mountain, is called by Mr. Fox *S. costata*, but I find no such name in the catalogues; the other, from the Mesilla Valley, is stated by Mr. Fox to be near *S. consors*.

*Elis xantiana*, Sauss., and *E. zonaria*, Cress., were taken by Dr. S. Lewis. The former is not uncommon in the Mesilla Valley.

*E. plumipes*, Drury, has been taken by Townsend in the Mesilla Valley. I have also an Albuquerque specimen, received years ago from Mr. Ashmead; it was probably collected by Prof. Wickham. I took a specimen at Bernalillo early in July.

#### POMPILIDÆ.

*Pompilus aethiops*, Cress.—Recorded by Townsend from Vega S. José.

*P. ferrugineus*, Say—Recorded by Townsend from the Gila River.

*P. marginatus*, Say, det. Fox—Rincon, July 5.

*P. porus*, Fox, det. Fox—Las Cruces, June 5, on *Chilopsis linearis*. A species of Lower California, now first reported from the U. S.

*P. relativus*, Fox, det. Fox—Las Cruces, July and August.

*P. torridus*, Smith, det. Fox—Las Cruces, July 12. A Mexican species, now first reported from the U. S.

*P. parvus*, Cress. (?), var., det. Fox—Mesilla, Oct. 29. Blue-black, 9 mm. long; abdomen quite bluish; upper wings fuliginous, lower wings hyaline except the ends.

*Aporus fasciatus*, Smith, det. Fox—Mesilla Park, April.

I have also taken a doubtfully new *Aporus* in the Mesilla Valley.

*Priocnemis terminatus*, Say, det. Fox — Albuquerque, June 30.

*Ceropales fulvipes*, Cress. — Collected by Townsend in the Mesilla Valley.

*C. fraterna*, subsp. *occidentalis*, Ckll. — Ruidoso, about 6500 ft. (Townsend).

*Pepsis formosa*, Say — Common in the Mesilla Valley. The females agree with *formosa*, but the males are *P. chrysothermis*, R. Lucas. Some specimens (♂♀) taken by Prof. Townsend at Las Cruces have the wing-coloring of *P. nephele*, R. Luc., which should be known as *P. formosa* var. *nephele*. The *P. formosa* of Lucas, distinct by the characters of the ♂ abdomen (See Fox's table, Proc. Ent. Soc. Wash., IV., 142), is apparently not known from the region whence came Say's type, being more southern in its distribution. It may be called *P. pseudoformosa*.

Mixed with the males of *P. formosa*, I find I have a *Mygnimia* (presumably *M. ustulata*, Dahlb.) looking exactly like them. It was taken at Las Cruces by Prof. Townsend.

#### SPHECIDÆ.

*Ammophila wrightii*, Cress., and *A. varipes*, Cress., were collected by Dr. S. Lewis in 1867.

*A. argentifrons*, Cress., is not uncommon at Santa Fé.

*A. communis*, Cress., det. Fox — Gila River (Townsend).

*A. luctuosa*, Smith, det. Fox — Santa Fé, July 21.

*A. yarrowi*, Cress., det. Fox — Santa Fé, June 21.

*A. pictipennis*, Walsh, det. Fox — Las Cruces.

*A. pruinosa*, Cress., det. Fox — Common in the Mesilla Valley; taken at flowers of *Solanum elaeagnifolium*, *Aster spinosus*, *Chrysanthemum* (cult.), *Melilotus indica* and *Bigelovia* or *Isocoma heterophylla* var. *wrightii*.

*A. varipes*, Cress., det. Fox — Las Cruces, July 13.

*A. vulgaris*, Cress. (?), det. Fox — Las Cruces, June.

*A. ferruginosa*, Cress. — Mesilla Valley.

*A.* sp. incert., det. Fox — Las Cruces, July 12. About 28 mm. long, abdomen red with a black dorsal patch, legs red.

*Pelopaeus servillei*, Lep.—Mesilla Valley, very abundant. Also at El Rito (*Townsend*) and Albuquerque (*Ckll.*).

*Sphex ichneumonea*, L.—Santa Fé (*Ckll.*), Vega S. José (*Twns.*), El Rito (*Twns.*).

*S. belfragei*, Cress.—Las Cruces, June 9.

*S. nearcticus*, Kohl—Common in the Mesilla Valley.

*S. cæruleus*, L.—Vega S. José, according to Townsend.

*S. occultus*, Kohl—Vega S. José and El Rito (*Townsend*).

*Priononyx thomæ*, Fabr., was taken by Dr. S. Lewis.

*P. atrata*, Lep., is common at Santa Fé.

*P. foveotatus*, Tasch., det. Fox—Taken by Townsend in great numbers on the Gila River.

#### MIMESIDÆ.

*Psen frontalis*, Fox, and *P. suffusus*, Fox, occur in the Mesilla Valley; the latter also at Rincon.

#### PEMPHREDONIDÆ.

*Spilomena pusilla*, Say—Las Cruces, June 4.

*S. foxii*, Ckll.—Santa Fé.

*Diodontus gillettei*, Fox, det. Fox, ♂—Mesilla Park, on *Sophia*, March 31, 1896.

*D. leguminiferus*, Ckll. and Fox—Santa Fé, July 10.

*D. nigritus*, Fox, det. Fox—Mesilla Park, at *Melilotus indica*, May.

*D. rugosus*, Fox, det. Fox—Santa Fé, July 5, at foliage of apricot.

*D. occidentalis*, Fox, det. Fox—Las Cruces.

*Stigmus inordinatus*, Fox, det. Fox—Santa Fé, Aug. 18, in Archbishop Lamy's garden.

*S. fraternus*, Say, det. Ashm.—Mesilla, Aug. 29, on *Isocoma wrightii*.

*Ammoplanus mandibularis*, Ashm. MS.—Santa Fé, July 19.

*A. laevis*, Prov., det. Ashm.—Mesilla, May; Mesilla Park, June 24. I have also taken it at El Paso, Texas. The species was described as an *Anacrabro*.

*Passaloecus annulatus*, Say—Santa Fé, July 10.

*P. armeniacæ*, Ckll. & Fox—Santa Fé, July 4.

## CRABRONIDÆ.

*Anacrabro boerhaaviae*, Ckll. — Mesilla Valley.

*Crabro dilectus*, Cress., is recorded by Townsend from the Continental Divide, Tenaja.

*C. packardi*, Cress. — Ruidoso, about 6500 ft., July 21, on flowers of *Cicuta occidentalis*: coll. Townsend.

*C. minimus*, Pack., *C. centralis*, Cam., *C. errans*, Fox, *C. decorus*, Fox, *C. salicis*, Ckll., and *C. abdominalis*, Fox, occur in the Mesilla Valley. The record of *C. minimus* is based on a ♂ identified by Fox in 1893, but as the locality is not mentioned in his later revision of *Crabro*, there may have been some error. *C. abdominalis* was recognized recently by Fox in a specimen taken on *Isocoma wrightii* at Mesilla Park, Sept. 12. *C. decorus* I took at Mesilla, May 8, burrowing in a sandbank.

*C. errans*, Fox, also occurs at Santa Fé, in August.

*C. maculiclypeus*, Fox, det. Fox — Santa Fé, July 10.

*Oxybelus quadricolor*, Ckll. & Baker, *O. trifidus*, Ckll. & Baker, *O. quadrinotatus*, Say, and var. *montanus*, Rob., occur at Santa Fé.

*O. heterolepis*, Ckll. & Baker, and var. *defectus*, Ckll. & Baker, *O. packardi*, Rob., and *O. cornutus*, Rob., are found at Albuquerque.

*O. sparideus*, Ckll., *O. subcornutus*, Ckll., *O. quadricolor*, C. & B., *O. coloradensis*, Baker, *O. cornutus*, Rob., and *O. abdominalis*, Baker, occur in the Mesilla Valley, the last taken by Townsend.

## CONTRIBUTIONS TO THE ENTOMOLOGY OF NEW MEXICO.

BY T. D. A. COCKERELL.

### II. SOME RECORDS OF DIPTERA.

I have in manuscript a catalogue of New Mexico Diptera, brought up to date, but there would be no special advantage in publishing it at the present time. Prof. Townsend has before him a considerable collection of New Mexico Diptera awaiting study, and it is to be hoped that he will eventually catalogue the species of the Territory. The present records are based on specimens collected by myself (unless otherwise stated), and determined by Mr. Coquillett. Most of the specimens are in the National Museum. In a few cases, duly indicated, the determinations are not Mr. Coquillett's.

#### CECIDOMYIIDÆ.

*Asphondylia* sp.—At Santa Fé, in August, I took a species which I suppose to be new, remarkable for its white tarsi.

#### MYCETOPHILIDÆ.

*Sciara dimidiata*, Say—Mesilla, April 19, on flowers of *Nasturtium sinuatum*.

*Sciara inconstans*, Fitch.—Mesilla, June 11, breeding in a box of plants in the house. They perished in numbers from the attacks of an *Empusa*, which Dr. R. Thaxter said appeared to be different from any species he had seen, unless it might be *E. gloeosporia*, Vuill.

*Neoglyptoptera winthemi*, Lehm.—Santa Fé, Aug 5.

*Eugnoriste occidentalis*, Coq.—Mesilla Valley, very abundant.

## BIBIONIDÆ.

*Scatopse pulicaria*, Loew.—Mesilla, under bark of apple tree, Nov. 16.

## CULICIDÆ.

*Culex consobrinus*, Desv.—Santa Fé ♂, July 5; ♀, July 29.

*Culex excitans*, Walk.—Santa Fé.

*Culex impiger*, Walk.—Colora'o near Rincon, July 10.

*Culex stimulans*, Walk.—Mesilla, Oct 26. Also found at Juarez (State of Chihuahua), Mexico, May 12.

*Anopheles punctipennis*, Say.—Colora'o near Rincon, July 10.

## CHIRONOMIDÆ.

*Chironomus tricinctus*, Meig.—Santa Fé, July 5.

## PSYCHODIDÆ.

*Psychoda minuta*, Banks.—Las Cruces, Feb. 25. On Nov. 9 I took a specimen in Mesilla on an apple tree; this was determined by Mr. Banks.

## TIPULIDÆ.

*Symplecta punctipennis*, Mg.—Mesilla. April 22, at light.

## STRATIOMYIDÆ.

*Nemotelus canadensis*, Loew.—Albuquerque, Aug. 16, on *Isocoma heterophylla*.

## ASILIDÆ.

*Atomosia puella*, Wied.—Mesilla, July 20.

*Mallophora faunrix*, O. S.—Mesilla, July 22.

*Mallophora guildiana*, Will.—Las Cruces, Aug 5.

*Erax varipes*, Will.—Socorro, June 29.

*Erax albobarbis*, Macq.—Mesilla Park, June 17. *E. cinerascens*, Bell., which is supposed to be conspecific with *albobarbis*, was taken at Albuquerque and Las Cruces.

*Erax dubius*, Will.—Las Cruces.

*Erax latrunculus*, Will., occurs in the Mesilla Valley.

*Proctacanthus milbertii*, Mcq.—Las Cruces.

*Proctacanthus philadelphicus*, Mcq.—Las Cruces, preying on *Synchloe lacinia*.

APIOCERIDÆ.

*Apiochera haruspex*, O. S.—Mesilla Park, May 21.

BOMBYLIDÆ.

*Anthrax effrena*, Coq.—Deming, July 9. Also in the Mesilla Valley.

*Anthrax lateralis*, Say—Rincon, July 6. Santa Fé, July 21, on *Argemone platyceras*.

*Anthrax curta*, Loew.—Las Cruces, July 23, on *Solanum elaeagnifolium*.

*Anthrax costata*, Say—Las Cruces, Aug. 24, on *Solidago canadensis arizonica*.

*Anthrax sinuosa*, Wied.—Dripping Spring, Organ Mts., April.

*Anthrax muscaria*, Coq.—Las Vegas, July.

*Anthrax syrtis*, Coq.—Mesilla Park, April 26, at flowers of *Aphanostephus ramosissimus*.

*Anthrax edititia*, Say—Mesilla Park, Sept. 17, on *Pectis papposa*.

*Anthrax eudora*, Coq.—Mesilla Park, Sept. 17.

*Argyramæba daphne*, O. S.—Santa Fé, Aug. 16 (Veer Boyle), Aug. 2.

*Argyramæba ædipus*, Fab.—San Augustine (base of Organ Mts.), Aug. 29. Mesilla Park, Sept.

*Sparnopolius fulvus*, Wied.—Las Cruces, Oct. 5, on *Verbesina encelioides*.

*Comastes robustus*, O. S.—Albuquerque, June 30.

*Anastoechus nitidulus*, Fabr.—Mesilla Park, Sept.

*Lordotus junceus*, Coq.—Mesilla Park, Sept. 17, on *Pectis papposa*.

*Phthiria sulphurea*, Loew.—San Marcial, June 28, on *Larrea tri-dentata*. Mesilla Park, Sept. 17, on *Pectis papposa*.

*Phthiria scolopax*, O. S.—Mesilla Park, Sept. 11, on *Isocoma wrightii*; April 26, at flowers of *Aphanostephus ramosissimus*.

*Geron senilis*, Fab.—Las Cruces, Aug. 25.

*Geron trochilus*, Coq.—Mesilla Park, Sept. 17, on *Pectis papposa*.

*Toxophora pellucida*, Coq. Mesilla Park, April 26.

THEREVID.E.

*Psilocephala platancala*, Loew.—Rincon, July 5, on mesquite. Roswell, April 15.

*Psilocephala rufiventris*, Loew.—Las Cruces.

*Psilocephala haemorrhoidalis*, Macq.—Las Cruces. Santa Fé, July 3, on foliage of box-elder.

SCENOPINID.E.

*Scenopinus occidentalis*, Coq.—Mesilla, Sept. 1.

EMPID.E.

*Drapetis divergens*, Loew.—Santa Fé, end of July.

*Tachydromia postica*, Walk.—Mesilla, on *Sambucus mexicanus*.

*Mythicomyia rileyi*, Coq.—Mesilla Park, April 12. Swept from *Sophia halictorum*.

*Platypalpus aequalis*, Loew.—Las Cruces. Santa Fé, July 24.

*Platypalpus trivialis*, Loew.—Santa Fé, June 25, on almond.

DOLICHOPODID.E.

*Dolichopus coloradensis*, Aldr., +, det. Aldrich.—Santa Fé, July 3, on foliage of box-elder.

*Dolichopus obcordatus*, Aldr., det. Aldrich.—Santa Fé, Aug. 18, in Archbishop Lamy's garden.

*Hercostomus*, n. sp., det. Aldrich.—Santa Fé, July 3.

*Porphyrops nigricoxa*, Loew., det. Coq.—Santa Fé, July 6.

*Diaphorus leucostomus*, Loew., det. Coq.—Mesilla Valley.

*Chrysotus* sp., ♂, +, det. Aldrich.—Las Cruces, June 10, swept from alfalfa.

*Hydrophorus*, n. sp., det. Aldrich.—San Augustine Ranch, Organ Mts., Aug. 28.

*Psilopus melampus*, Loew., det. Aldrich.—Santa Fé, July 3, on foliage of box-elder.

## CONOPIDÆ.

*Zodion splendens*, Jaenn.—Deming, July 9.

## PIPUNCUDIDÆ

*Pipunculus subopacus*, Loew.—Mesilla, Oct 26.

## ESTRIDÆ.

*Œstrus ovis*, L., det. Ckll.—Anton Chico, 1898. (J. M. Abercrombie.)

## TACHINIDÆ.

*Archytas lateralis*, Macq.—Mesilla, April 18, at flowers of plum.

*Tachina mella*, Walk.—Mesilla Park, Sept. 12, on *Isocoma wrightii*. This was *T. orgyiae*, Twns., now referred to *mella*.

*Senotainia rubriventris*, Macq.—Mesilla Park, Oct. 27. *S. flavicornis*, Twns., now referred by Coquillett to *rubriventris*, was taken at Santa Fé, July 5.

*Paradidyma singularis*, Twns., (i. e., *P. magnicornis*, Twns., now referred to *singularis*). Little Mountain, Mesilla Valley, March 26, on *Streptanthus carinatus*.

*Linnæmyia comta*, Fall.—Santa Fé, Aug. 2, on *Asclepias*.

*Sturmia inquinata*, V. d. W.—Mesilla, bred from a *Phlegethonius* larva found by Miss Alice Casad.

*Distichona varia*, V. d. W.—Rincon, July 5, on *Chilopsis linearis*. Las Cruces, Aug. 25, on *Solidago canadensis arizonica*. Las Cruces, Aug. 25, caught by a *Phymata*.

*Euphorocera claripennis*, Macq.—Mesilla Park, Sept. 12, on *Isocoma wrightii*.

*Exorista confinis*, Fall. (i. e., *E. theclarum*, Scudd., now referred to *confinis*). Mesilla Valley, bred from *Lycæna exilis*.

*Myiophasia ænea*, Wied. (i. e., *Phasioclista metallica*, Twns.). Santa Fé, July 6.

*Epigrinnyia robertsonii*, Twns.—Santa Fé, July 5.

*Chætogædia crebra*, V. d. W.—Mesilla, Oct. 26.

*Paradidyma singularis*, Twns.—Las Cruces, end of August. This species moves its wings up and down in a curious manner.

*Drepanoglossa lucens*, Twns — Santa Fé, July 6.

*Allophora occidentis*, Walk. — Colora'o near Rincon, July 10.

#### SARCOPHAGIDÆ.

*Sarcophaga georgina*, Wied.—Hagerman (Pecos Valley); Las Cruces; Santa Fé, July 17.

*Sarcophaga sarracenia*, Riley—San Marcial, June 28; Las Cruces, October.

*Sarcophaga incerta*, Walk.—Las Cruces; Mesilla Park, April 9, at flowers of plum.

#### MUSCIDÆ.

*Lucilia cæsar*, L.—Mesilla, Nov. 4, at decaying apples.

*Lucilia cornicina*, Fb.—Mesilla, Nov. 20, at decaying apples.

*Calliphora erythrocephala*, Meig.—Mesilla Valley and Santa Fé.

*Muscina stabulans*, Fall.—Santa Fé, June.

*Muscina cæsia*, Meig.—Mesilla, Nov. 20, at decaying apples.

#### ANTHOMYIDÆ.

*Ophyra leucostoma*, Wied.—Santa Fé, July 3.

*Anthomyia pluvialis*, L.—Santa Fé, July.

*Homalomyia scalaris*, Fb.—Santa Fé, July 3. Raton, July 14.

*Homalomyia canicularis*, L., det. Johnson—Santa Fé, June 20.

*Cænosia fuscopunctata*, Macq.—Mesilla.

*Cænosia lata*, Walk.—Mesilla, Oct. 27.

#### HELOMYZIDÆ.

*Blepharoptera cineraria*, Loew.—Mesilla, Nov. 16, on trunk of an apple tree.

#### MICROPEZIDÆ.

*Micropeza producta*, Walk.—Mesilla, on *Sambucus mexicana*.

#### ORTALIDÆ.

*Anacampta latiuscula*, Loew.—Las Cruces, May. (Miss Agnes Williams.)

*Œdopa capito*, Loew.—Mesilla Park, Sept. 12, on *Isocoma wrightii*.  
*Chætopsis debilis*, Loew.—Mesilla, Oct. 26. The type locality is Cuba!

TRYPETIDÆ.

*Trypeta genalis*, Thoms.—Mesilla.  
*Trypeta tapetis*, Coq.—Santa Fé, June 27, on alfalfa.  
*Trypeta bella*, Loew.—Mesilla, on *Yucca*.  
*Trypeta (Urellia) solaris*, Loew.—Las Cruces, Sept. 8, on *Isocoma wrightii*.  
*Trypeta abstensa*, Loew.—Mesilla Park, April 12, swept from *Sophia halictorum*.  
*Trypeta (Spilographa) flavonotata*, Macq.—Mesilla; Santa Fé, July 6.  
*Trypeta electa*, Say.—Las Cruces, July 12.  
*Trypeta (Carpotricha) culta*, Wied., det. Ckll. and W. A. Snow.  
Las Cruces, July 29.

SAPROMYZIDÆ.

*Pachycerina verticalis*, Loew.—Mesilla Valley.  
*Pachycerina limbipennis*, Coq.—Santa Fé, July 5.

SEPSIDÆ.

*Sepsis violacea*, Meig.—Mesilla Park, Sept. 12, on *Isocoma wrightii*; Florida, on *Actinella*, July 6.

*Sepsis cynipsea*, L.—Santa Fé, July 6; Mesilla.

DROSOPHILIDÆ.

*Drosophila ampelophila*, Loew., det. Ckll.—Abundant in Mesilla.  
*Drosophila graminum*, Zett.—Mesilla.  
*Drosophila apicata*, Thoms.—Mesilla.  
*Drosophila adusta*, Loew.—Mesilla.  
*Drosophila funebris*, Fabr.—Mesilla.

OSCINIDÆ.

*Siphonella flavipes*, Coq. MS.—Santa Fé, July 19.  
*Mosilus cæneus*, Fall.—Rincon, on *Chilopsis linearis*, July 5.

## AGROMYZIDÆ.

*Leucopis bella*, Loew. — Organ, (5100 ft.), Sept. 28.

*Agromyza aeneiventris*, Fall. — Mesilla Park, Oct. 27.

*Agromyza platyptera*, Thoms. — Mesilla, on *Sambucus mexicana*.

*Odontocera dorsalis*, Loew. — Santa Fé, July 5.

In Bull. 10, N. S., Div. Ent., Dept. of Agriculture, (1898), p. 77, Mr Coquillett has some notes on *Leucopis bella*, Will. The specimens bred from *Orthezia nigrocincta* were from Tularosa Creek, near the Mescalero Agency; not from Mesilla. It may be added that the specimens from Mexico were found at Valles (San Luis Potosi), preying on *Eriococcus dubius*, Ckll.

**SUPPLEMENT TO A REVISION OF THE  
MELANOPLI.**

— — — — —  
BY SAMUEL H. SCUDDER.

Since the publication a year ago of my Revision of the Melanoplus (Proc. U. S. Nat. Mus., XX, 1-421, pl. 1-26), and in part, at least, in consequence of it, a considerable number of new forms have been discovered. In some cases these require considerable modification of the tables there prepared for the determination of the different species, especially in the genus *Melanoplus*, to which all but two of the new species belong. I have thought it advisable, therefore, to bring the descriptions of the new forms together and to introduce such alterations in the different tables as will enable one to place any of the new forms (both those here described and those described by others this year) as easily as the old.

Most of the species here described were obtained by the careful collecting of Mr. A. P. Morse along the Pacific coast from southern California to northern Oregon, in the summer of 1897. Of these Mr. Morse has given me the full use. The others are principally due to the efforts of Mr. C. F. Baker, Dr. J. L. Hancock and Prof. Otto Lügger, to whom I am indebted for their forwarding of material.

I follow in this paper the order of my Revision, to which I have constantly to refer.

**PODISMA Latreille.**

In an interesting paper on "The Grasshoppers and Locusts of New Zealand and the Kermadec Islands" (Trans. N. Zeal. Inst., XXX., 135-150, pl. 14, 1897), Capt. F. W. Hutton describes four species which he refers to the genus *Pezotettix* Burm. (= *Podisma* Latr.). This is the first reference of the genus to the southern hemisphere, Japan being the nearest country in which the genus was known; but I think it a mistaken reference. I have not seen any specimens of the species described by him, but he has kindly sent me some of the genera he

regards as allied, and from these and his descriptions and figures I should judge that all belonged to the gerontogeic *Calopteni*, rather than to the *Melanopli*. It is at least pretty certain that they do not belong to *Podisma*.

Among the more interesting of the Acridiidæ obtained in Oregon in the summer of 1897 by Mr. A. P. Morse was an apterous species of *Podisma*, the apterous section of the genus having heretofore been known in America only from the extreme east. The table in my Revision (p. 97) may be thus recast, so far as the apterous species are concerned, to accommodate the new form:

TABLE OF THE APTEROUS NORTH AMERICAN SPECIES OF *PODISMA*.

*a*<sup>1</sup>. Smaller species. Hind tibiae green or greenish; lower apical angle of male cerci angulate, but not decurved.

*b*<sup>1</sup>. Hind femora conspicuously fasciate with fuscous; cerci very slender, in the middle distinctly less than half as broad as the base.

*variegata* Scudd.

*b*<sup>2</sup>. Hind femora almost uniformly green; cerci relatively stout, in the middle distinctly more than half as broad as the base. . . . *glacialis* Scudd.

*a*<sup>2</sup>. Larger species. Hind tibiae yellowish (♂) or reddish (♀); lower apical angle of male cerci distinctly produced and decurved. . . . *polita* sp. nov.

*Podisma polita* sp. nov.

Plate VII., Figures 1, 2.

Dark olivaceous green, more or less flavous beneath (♂), or testaceo-olivaceous, so heavily flecked and punctate with fuscous as to appear griseous, pale testaceous beneath (♀), the sides with a broad, postocular, piceous band extending across the pronotum, enlarged upon the metazona and continued as a fuscous or piceous belt backward nearly to the end of the abdomen, at least in the male. Head olivaceo-testaceous, more or less heavily or lightly flecked with fuscous, heavily on summit, the postocular band edged narrowly above with testaceous; vertex slightly tumid, scarcely elevated above the pronotum, the interspace between the eyes twice (♂) or fully twice (♀) as broad as the first antennal joint; fastigium considerably declivient, scarcely arcuate, lying wholly below (♂) or at (♀) the upper level of the eyes, so as not to be wholly seen on a side view, slightly (♂) or scarcely (♀) sulcate, angularly expanded laterally in front; frontal costa percurrent, subequal, faintly expanded between the antennæ as seen from in front, a little (♂) or distinctly (♀) narrower than the

interspace between the eyes, a little sulcate except, perhaps, above, sparsely biseriately punctate above; eyes rather small, prominent in the male, scarcely (+) or fully (♂) as long as the infraocular portion of the genæ; antennæ testaceous, more or less infuscated apically and lutescent basally, often more or less rufous, about four-fifths (♂) or two-thirds (♀) as long as the hind femora. Pronotum enlarging slightly on the posterior half, especially in the female, the disk olivaceous (♂) or olivaceo-testaceous most heavily punctate with fuscous (♀), convex and passing insensibly into the vertical lateral lobes, which are pale flavo-testaceous below, the piceous stripe with a concave lower margin; median carina slight, percurrent, subequal; front and hind margins truncate; prozona feebly longitudinal (♂) or quadrate (♀), punctate anteriorly and posteriorly (♂) or equally throughout (♀), almost twice as long as the punctate metazona. Prosternal spine blunt, conical, short, especially in the female; interspace between mesosternal lobes a little transverse and nearly as broad as the lobes (♂) or almost twice as broad as long and fully as broad as the lobes (+), the metasternal lobes subapproximate (♂) or nearly as distant as the mesosternal lobes (+). Tegmina wanting. Fore and middle femora considerably tumid in the male, olivaceo-testaceous, more or less infuscated; hind femora slender, testaceous (+) or olivaceo-testaceous (♂) more or less infuscated in faint bifasciate clouds, beneath (and within at base) bright red, the geniculation blackish fuscous; hind tibiae luteous (♂) or reddish (+), the spines black in the apical half, 9-10 in number in the outer series. Abdomen hardly (♂) or distinctly (+) compressed, carinate, either dull olivaceo-testaceous, very heavily punctate with fuscous above, lighter below, the margins of the segments reddish (+), or olivaceous, more or less infuscated above, flavo-olivaceous below, the sides more or less piceous except apically (♂); sides of the first segment with a distinct tympanum; the extremity in the male clavate, considerably recurved, the supraanal plate triangular with feebly acutangulate and in no way blunted apex, the margins a little elevated flaringly in the basal two-thirds, the median sulcus confined to the basal half, distinct, between well rounded walls; furcula consisting of a pair of approximate, feebly divaricating, slender, hardly tapering, blunt, dark castaneous spines, extending over the supraanal plate by about twice the width of the last dorsal segment; cerci long and rather slender, erect, testaceous at base, becoming gradually infuscated apically, tapering in the basal half to about two-thirds the basal breadth, beyond equal as far

as the slightly expanded tip, which is incurved and has the lower apical angle produced to an acutangulate apex, which is also slightly decurved, the whole almost as long as the supraanal plate; subgenital plate a little bullate, short and broad, the upper margins in the same plane, broadly rounded as seen from above, entire, the apical face with a bluntly conical, moderate, submarginal tubercle.

Length of body, ♂, 19.5 mm.; ♀, 23.5 mm.; antennæ, ♂, 9.25 mm.; ♀, 8 mm.; hind femora, ♂, 11.5 mm.; ♀, 12 mm.

19 ♂, 8 ♀. Divide (Cottage Grove) Lane Co., Oregon, Sept. 12, A. P. Morse.

This species is more nearly related to *P. glacialis* than to *P. variegata*, differing from the former most noticeably in the color of the hind femora and tibiæ, and in its relatively longer male cerci with their decurved tip.

#### MELANOPLUS Stål.

As already stated, all the new Melanoplus that have been noted, with two exceptions, belong to this dominant genus. They will be brought under the several series to which they belong, and the tables for the determination of the species remodeled to introduce them. The number of species is now increased to upward of one hundred and fifty, thus surpassing all other North American genera of Orthoptera, but no new series are required to accommodate the additions, most of which are brachypterous.

#### FLABELLIFER Series.

A single Californian species is added to this series, its nearest neighbor being another Californian form, from which it may be separated by the following table of the short-winged species of this series, in modification of that given on pp. 124-125 of my Revision.

##### TABLE OF THE BRACHYPTEROUS SPECIES IN THE FLABELLIFER SERIES OF MELANOPLUS.

- a<sup>1</sup>. Tegmina about half as long as the abdomen and much longer than the pronotum. .... *discolor* Scudd., *simplex* Scudd.\*
- a<sup>2</sup>. Tegmina shorter than the pronotum.
  - b<sup>1</sup>. Furcula of male only as long as the last dorsal segment; cerci in apical half equal and deeply sulcate longitudinally, so as to appear bent at right angles. .... *rileyanus* McNeill.
  - b<sup>2</sup>. Furcula of male one-fifth as long as supraanal plate; cerci in apical half tapering, not sulcate. .... *blandus* sp. nov.

\* For separation of these species, see original table.

*Melanoplus blandus* sp. nov.

## Plate VII., Figure 3.

Dark brownish testaceous above, luteo-testaceous beneath, with a moderately narrow, postocular, piceous stripe crossing the prozona and sometimes in a diluted form the metazona. Head rather prominent, testaceous, heavily flecked and dotted with fuscous, especially above, the postocular band edged with luteo-testaceous; vertex well rounded, a little elevated above the pronotum, the interspace between the eyes scarcely or not broader than the first antennal joint; fastigium strongly declivous, deeply sulcate; frontal costa failing to reach the clypeus, subequal, slightly broader than the interspace between the eyes, feebly sulcate, strongly punctate throughout, biseriately above; eyes rather large and rather prominent, fully half as long again as the infraocular portion of the genæ; antennæ luteo-castaneous, a trifle infuscated apically, about two-thirds as long as the hind femora. Pronotum subequal, dull testaceous more or less punctate with fuscous, the lower portion of the lateral lobes lutescent, the disk gently convex and passing by a rounded shoulder, a little more abrupt on the metazona than on the prozona, into the vertical, anteriorly tumid lateral lobes; front margin subtruncate, hind margin very obtusangulate, the angle sometimes rounded; median carina percurrent, most distinct on the metazona, least distinct between the sulci; prozona distinctly longitudinal, a fourth to a third longer than the distinctly punctate metazona. Prosternal spine small, distinctly conical, erect, bluntly pointed; interspace between mesosternal lobes about half as long again as broad, the metasternal lobes subbattingent. Tegmina shorter than the pronotum, attingent, broadly ovate, apically rounded, but feebly angulate, blackish fuscous, excepting the anal area which is testaceous. Fore and middle femora feebly tumid, testaceous, more or less infuscated; hind femora testaceous, distinctly and obliquely bifasciate above with blackish fuscous, beneath rufescent, the geniculation infuscated; hind tibiae dull glaucous, often lutescent basally, with a fuscous annulation, the spines black except at base, 10-11 in number in the outer series. Extremity of abdomen a little clavate and upturned, the supraanal plate subtriangular with subrectangular apex, the median sulcus percurrent, broad and bounded by rather high ridges on basal half, slender with slight margins on apical half; furcula consisting of a pair of slender, tapering, parallel, blunt-pointed

fingers, extending over the basal fifth of the supraanal plate; cerci broad, laminate, torqueate, broadening on the basal third, where they are about two-thirds as broad as the hind femoral geniculation, then at once and regularly narrowing to half that width almost wholly by the excision of the lower margin, the apical portion strongly incurved, turned over the lip of the scoop formed by the subgenital plate, and twisted, but not abruptly, at right angles to the basal portion, the apex rounded, the upper margin nearly in one plane throughout but strongly arcuate; subgenital plate broad and nearly equal, especially where uniting with the lateral margins, the whole flaring faintly along the upper margin.

Length of body, 15 mm.; antennæ, 6.5 mm.; tegmina, 3 mm.; hind femora, 9.5 mm.

7 ♂. Summit of Mt. Wilson, Altadena, Los Angeles County, California, July 28, A. P. Morse.

This species is closely allied to *M. rileyanus*, found at lower levels in Los Angeles County, but differs from it in the longer furcula, and in the anal cerci, which are not equal in the apical half nor externally sulcate, so as to appear longitudinally bent at right angles, as in *M. rileyanus*.

#### BOWDITCHI SERIES.

Prof. C. F. Baker has sent me from Colorado a single specimen of a species of this series, which differs clearly from the others in the elevation and notching of the apical margin of the subgenital plate in the male. In order to bring it next its nearest ally, *M. bowditchi*, the table for the determination of the species in this series, as given in my Revision (p. 131), needs to be slightly remodelled, as follows:

##### TABLE OF THE SPECIES IN THE BOWDITCHI SERIES OF *MELANOPLUS*.

*a*<sup>1</sup>. Subgenital plate of male distinctly elevated apically above the lateral margins, and notched.....*incisus* sp. nov.  
*a*<sup>2</sup>. Subgenital plate of male not or hardly elevated apically above the lateral margins, and entire.

*b*<sup>1</sup>. Body, tegmina and legs brown or testaceous, the hind femora generally banded with dark colors.

*c*<sup>1</sup>. Forks of the male furcula more or less obliquely or transversely truncate at tip and given an oppositely hooked appearance by the rounded excision of the inner margin; hind femora generally distinctly banded.

*d*<sup>1</sup>. Rather uniform in coloring, the lateral lobes with no bright

stripe; male cerci in no way expanded apically, and externally tumid rather than sulcate.

*c<sup>1</sup>.* Lateral lobes of prozona with a broad and usually distinct piceous band above; tegmina generally distinctly flecked along the middle line ..... *howditchi* Scudd.

*c<sup>2</sup>.* Lateral lobes of prozona with a narrow or no distinct band above; tegmina very obscurely flecked, if at all, along the middle line ..... *flavidus* Scudd.

*d<sub>2</sub>.* Highly variegated, the lateral lobes of pronotum conspicuously marked with an unequal bright flavous stripe next the lateral carinæ; male cerci very feebly expanded and externally sulcate apically.

*pictus* Brun.

*c<sub>2</sub>.* Forks of the male furcula rounded symmetrically at tip, the inner margin scarcely more excised than the outer, so that the forks are straight and not oppositely hooked; bands of hind femora scarcely perceptible ..... *elongatus* Scudd.

*b<sub>2</sub>.* Body, tegmina and legs almost wholly green, the hind femora not banded.

*c<sup>1</sup>.* Disk of pronotum and summit of head uniform in coloration, the former passing into the lateral lobes with a more distinct angle than in the alternate category; hind tibiae blue; antennæ uniform.

*flavescens* Scudd.

*c<sup>2</sup>.* Sides of the disk of the prozona with a distinct narrow yellow stripe, extending to the upper margin of the eyes; passage of the disk of the pronotum into the lateral lobes more gradual than in the alternate category; hind tibiae green; antennæ apically infuscated.

*herbaceus* Brun.

*Melanoplus incisus* sp. nov.

Of pretty large size, fuscous marked with flavous, the darkest parts being a broad postocular stripe which extends to but not upon the metazona and a slightly narrower glistening stripe at the outer margin of the disk of the pronotum; beneath it is almost wholly flavous. Head more or less infuscated throughout, but especially above, though there is a dull flavous median vertical streak, and the upper margins of the postocular band are bordered with the same; vertex gently tumid, the interspace between the eyes about equalling the width of the frontal costa, the fastigium broadly and rather deeply sulcate; frontal costa moderate in breadth, subequal but a little narrowed above the ocellus, biseriately punctate above; eyes rather large and rather prominent; antennæ almost as long as the hind femora, fuscous-flavous. Pronotum subequal, feebly enlarging at the metazona, the front margin truncate, the hind margin very obtusely angulate, the

angle rounded, the disk gently convex on the prozona with no lateral carinæ, on the metazona plane with obscure rounded lateral carinæ; median carina slight though distinct and infuscated on the metazona, and less so on the front portion of the prozona; prozona barely longitudinal, smooth, but slightly longer than the feebly and rather sparsely punctate metazona. Prosternal spine moderate, compressed conical, blunt; interspace between mesosternal lobes narrow, at least four times as long as broad, but gradually broadening in posterior half, the metasternal lobes attingent over a long space. Tegmina slender, gently tapering throughout, apically rounded, surpassing a little the hind femora, pale fuscous, immaculate; wings pellucid, with a scarcely perceptible flavous tinge, the posterior veins pale glaucous. Fore and middle femora testaceous; hind femora fuscous on the outer face, tinged apically with blue, elsewhere flavous or orange flavous twice barred above with fuscous, the genicular lobes pallid with a basal fuscous spot, the genicular arc heavily infuscated; hind tibiæ dark glaucous, pallescent at extreme base, the spines pale glaucous with blackish fuscous tips, 10-11 in number in the outer series. Extremity of abdomen feebly clavate, upturned, the supraanal plate obscurely clypeate, the lateral and apical margins a little and broadly raised, the median sulcus obsolete; furcula consisting of a pair of strongly flattened, straight, parallel plates, broad and attingent in basal half, each suddenly narrowing to half its former width by the rounded excision of its inner margin, the apex broadly rounded and reaching beyond the middle of the underlying plate; cerci rather small, tapering to a little more than half their extreme width in the basal half, when each is bent slightly inward, thereafter continues equal to the blunt and rounded tip, which fails considerably to reach the tip of the supraanal plate; subgenital plate forming a well-rounded scoop, the apical margin of which is distinctly elevated and bluntly notched, and notwithstanding this elevation considerably narrower apically than at base.

Length of body, 25 mm.; antennæ, c. 13 mm.; tegmina, 22 mm.; hind femora, 14.5 mm.

1 ♂. Fort Collins, Larimer County, Colorado, August 11, C. F. Baker.

This species is separable from all others of the Bowditchi series by the elevation of the apical margin of the subgenital plate of the male; it bears the closest general resemblance to *M. bowditchi*.

## INDIGENS SERIES.

I am inclined to place here an interesting species\* sent to me by Dr. Hancock from the mountains of Arizona, although it differs considerably from the single species formerly placed here and will require some modification of the characters given to the series in my former table (Revision, p. 125), and in the text (p. 210), in that the anal cerci, though broad and long and subequal, do narrow considerably in the basal half, and in the middle are distinctly narrower than the frontal costa, and are incurved and apically angulate, while the apical margin of the subgenital plate is not elevated to a blunt tubercle; furthermore its abdomen is distinctly clavate at tip and the supraanal plate does not have the lateral margins mesially notched. The points of distinction between the two species may be tabulated thus:

TABLE OF THE SPECIES IN THE INDIGENS SERIES OF MELANOPLUS.

♂1. Tegmina slightly distant ( $\delta$ ); abdomen of male hardly clavate at apex; supraanal plate with lateral margins mesially notched; cerci straight, scarce'y tapering in basal half, broader than the frontal costa, apically rounded or subangulate; subgenital plate considerably elevated apically into a slight rounded tubercle..... *indigens* Scudd.

♂2. Tegmina attingent ( $\delta$ ) or subattingent ( $\varphi$ ); abdomen of male distinctly clavate; lateral margins of supraanal plate entire; cerci incurved, tapering distinctly in basal half, narrower than the frontal costa, apically produced and angulate; subgenital plate with the apical and lateral margins in the same plane, without tubercle ..... *femur-nigrum* sp. nov.

## MELANOPLUS FEMUR-NIGRUM SP. NOV.

## Plate VII., Figure 4.

About or rather below the medium size, dark fuscous above, pale flavous beneath and with pale flavous markings, conspicuous in a stripe following the lower margin of the outer face of the hind femora, and an oblique metapleural stripe. Head not prominent, plumbeo-testaceous infuscated above, the vertex gently convex, slightly elevated above the pronotum, the interspace between the eyes fully as wide as ( $\delta$ ) or considerably wider than ( $\varphi$ ) the first antennal joint; fastigium steeply declivit, distinctly sulcate, at least in the male; frontal costa sub-

\* I am not able at the moment to compare this directly with the species on which the series was founded.

equal, almost percurrent, about as wide as the interspace between the eyes, sulcate throughout (♂) or below the ocellus (♀), biseriately and irregularly punctate throughout; eyes not very large nor very prominent, but distinctly longer than the infraocular portion of the genæ; antennæ varying from luteous to castaneous, more or less infuscated apically, about as long (♂) as the hind femora. Pronotum fuscous, with a broad, piceous, postocular band on the prozona (below which the lateral lobes, at least on the prozona, approach the color of the under surface, and next which the disk is feebly pallid), enlarging feebly and regularly from in front backward, especially in the female; disk feebly convex, passing by a feeble angulation into the subvertical lateral lobes; median carina percurrent, but feebler though uniform on the prozona; front margin truncate, hind margin feebly and roundly angulate; prozona a little longitudinal (♂) or longitudinally subquadrate (♀), nearly a third longer than the finely and obscurely punctate metazona. Prosternal spine short, erect, very blunt conico-cylindrical; interspace between mesosternal lobes subquadrate (♂) or distinctly transverse (♀), the metasternal lobes approximate (♂) or rather distant (♀). Tegmina abbreviate, a little shorter than the pronotum, ovate, less than twice as long as broad, attinging (♂) or subattinging (♀), dark fuscous or blackish fuscous, the apex rounded angulate. Fore and middle femora somewhat tumid in the male; hind femora blackish fuscous above, the outer face nearly black, with the stripe mentioned, pale orange beneath with a pale, pregenicular semi-annulus on the inner side; hind tibiæ blue, the spines black, 10-11 in number in the outer series. Abdomen pale flavous, a little infuscated above and the sides piceous basally, the extremity in the male considerably clavate and considerably recurved, the supraanal plate broad hastate, nearly plane, with acutangulate apex and shallow, rather broad, percurrent median sulcus, margined by low blunt walls; furcula consisting of a pair of slight dentiform projections, slightly divercating and extending beyond the last dorsal segment by less than its length; cerci moderately stout laminæ, tapering gently in the basal half and straight, then equal for a short distance and slightly incurved, and then tapering rapidly and curving strongly inward to a terminal hook which just fails to reach the tip of the supraanal plate; subgenital plate small, flaring a little, of equal breadth and almost as long as its apical breadth, the lateral and apical margins in the same plane, a little angulated where they meet.

Length of body, ♂, 15.5 mm., ♀, 19.5 mm.; antennæ, ♂, 9 mm., ♀, 8 mm.; tegmina, ♂ ♀, 4.25 mm.; hind femora, ♂, 9.75 mm.

13 ♂, 1 ♀. San Francisco Mts. near Flagstaff, Coconino Co., Arizona, July 30, Dr. J. L. Hancock.

#### MANCUS SERIES.

The number of species belonging here has been nearly doubled by the discoveries of the past year, compelling a complete remodelling of the table (Revision, pp. 125-126) of the species of this series. More than one of the species have the apical margin of the subgenital plate slightly elevated, so that characters drawn from this part will not serve to distinguish it from the Indigens Series, particularly if we are to add to that series the species just described, without apical elevation to its plate.

#### TABLE OF THE SPECIES IN THE MANCUS SERIES OF MELANOPLUS.

*a*<sup>1</sup>. Prozona, at least in male, much longer than broad, the disk of the whole pronotum distinctly more than twice as long as middle breadth; interspace between mesosternal lobes of male twice or almost twice as long as broad.

*b*<sup>1</sup>. Antennæ of male about two-thirds as long as hind femora; hind margin of pronotum subtruncate or almost subtruncate; cerci of male more or less twisted as well as incurved.

*c*<sup>1</sup>. Hind tibiæ blue; furcula of male prominent; cerci considerably torqueate, deeply sulcate exteriorly in apical half, which is but little narrower than the basal half, and not bent upward; apical margin of subgenital plate slightly elevated, well rounded as seen from above

*varicus* sp. nov.

*c*<sup>2</sup>. Hind tibiæ red; furcula of male slight; cerci only slightly torqueate and shallowly sulcate, the apical half much narrower than the basal, and bent upward; apical margin of subgenital plate not elevated, angulate as seen from above.....*immunis* sp. nov.

*b*<sup>2</sup>. Antennæ of male five-sixths as long as hind femora; hind margin of pronotum distinctly obtusangulate; cerci of male throughout in nearly one obliquely vertical plane, though incurved.....*scudderii* Uhler

*a*<sup>2</sup>. Prozona, even in male, transverse, subquadrate or slightly longitudinal, the disk of the whole pronotum less than twice as long as middle breadth; interspace between mesosternal lobes of male not or scarcely more than half as long again as broad.

*b*<sup>1</sup>. Male cerci of subequal width, the apical being scarcely narrower than the basal half.

*c*<sup>1</sup>. Male abdomen strongly recurved; forks of furcula divergent, dis-

tinctly longer than the last dorsal segment; subgenital plate with no apical tubercle.....*gillettei* Scudd.

*c<sup>2</sup>*. Male abdomen scarcely recurved; forks of furcula parallel, minute, hardly as long as the last dorsal segment; subgenital plate with a slight apical tubercle.....*artemisia* Brun.

*b<sup>2</sup>*. Male cerci of distinctly unequal width.

*c<sup>1</sup>*. Male cerci tapering only in basal half, the apical half subequal, apically rounded; furcula distinct though slight.

*d<sup>1</sup>*. Pronotum subtruncate posteriorly; tegmina shorter than the pronotum, broadly rounded or subangulate at apex; male cerci long and rather slender, nearly straight as seen laterally...*mancus* Smith.

*d<sup>2</sup>*. Pronotum obtusangulate posteriorly; tegmina as long as or longer than the pronotum, apically acuminate; male cerci short and not very slender, rather strongly bent-arcuate as seen laterally.

*e<sup>1</sup>*. Tegmina of male considerably longer than pronotum; furcula considerably longer than the last dorsal segment; apical margin of subgenital plate slightly elevated, well rounded, in no way tuberculate.....*acutus* sp. nov.

*e<sup>2</sup>*. Tegmina of male scarcely if at all longer than pronotum; furcula no longer than last dorsal segment; apical margin of subgenital plate feebly elevated to a slight tubercle.....*cancri* Scudd.

*c<sup>2</sup>*. Male cerci nearly equal in basal half, tapering regularly in the apical half, apically acuminate; furcula subobsolete.....*usitatus* sp. nov.

*Melanoplus varicus* sp. nov.

Plate VII., Figures 5, 6.

Of small size, fusco-testaceous above, pallid testaceous beneath, with a broad piceous or subpiceous postocular band crossing the head and prozona. Head not prominent, or but slightly so, pallid testaceous, more or less flecked with fuscous, especially above, the postocular band distinctly margined above and generally below with flavo-testaceous; vertex tumid, elevated distinctly above the pronotum, the interspace between the eyes fully as broad as ( $\sigma$ ) or half as broad again as ( $\varphi$ ) the first antennal joint; fastigium steeply declivent, sulcate; frontal costa subequal, just failing to reach the clypeus, fully as broad as the interspace between the eyes, faintly sulcate below the ocellus, irregularly punctate above; eyes moderately large and rather prominent, much longer than the infraocular portion of the genæ; antennæ testaceous, apically slightly infuscated, fully two-thirds ( $\sigma$ ) or less than one-half ( $\varphi$ ) as long as the hind femora. Pronotum subequal but faintly expanding on the metazona, fusco-testaceous or pale

testaceous flecked with fuscous on the disk, which is broadly convex, passing by a rounded but still distinct shoulder into the lateral lobes, where each half of the prozona but especially the anterior half is feebly and independently tumid; median carina distinct and percurrent, more distinct on the metazona, sometimes obsolescent between the sulci; front margin faintly convex, hind margin feebly angulate; prozona longitudinal, about a third as long again as the more distinctly and more finely punctate metazona. Prosternal spine short, erect, blunt conical; interspace between mesosternal lobes nearly three times as long as broad (♂) or quadrate (♀), the metasternal lobes subattingent (♂) or approximate (♀). Tegmina abbreviate, a little shorter than the pronotum, attingent, broad ovate, apically subangulate, fusco-testaceous, pale testaceous in the anal field, which is thus slightly contrasted. Fore and middle femora feebly tumid in the male; hind femora moderately slender, testaceous, broadly and obliquely bifasciate with fuscous, sometimes blended on the outer face, ferruginous beneath, the geniculation fuscous; hind tibiae blue, often more or less testaceous at base, with a narrow black postgenicular annulus, the spines black, 10-11 in number in the outer series. Abdomen testaceous, subflavous beneath, the sides more or less piceous, the extremity in the male a little clavate, slightly recurved, the supraanal plate triangular with scarcely elevated margins, the median sulcus moderately coarse, percurrent, between distinct walls considerably elevated basally; furcula consisting of a pair of flattened, tapering, acuminate fingers, diverging at right angles and nearly a third as long as the supraanal plate; cerci forming moderately broad, gently tapering, compressed laminæ, less than three times as long as middle breadth, two-thirds as broad apically as basally, the apex broadly convex and the apical half gently incurved and externally rather deeply sulcate; subgenital plate small, of nearly equal length and breadth, the apical margin slightly elevated, thickened and entire.

Length of body, ♂, 16.5 mm., ♀, 20 mm.; antennæ, ♂, 6.25 mm., ♀, 6 mm.; tegmina, ♂, 3.25 mm., ♀, 5 mm.; hind femora, ♂, 9 mm., ♀, 11 mm.

14 ♂, 6 ♀. Tehachapi, Kern Co., California, August 2, A. P. Morse.

This species is very distinct from any other by the considerable twist and deep sulcation of the male cerci.

*Melanoplus immunis* sp. nov.

Of small size and moderately slender, very dark fuscous, ferrugineo-testaceous beneath, with a broad postocular piceous band reaching across the prozona. Head not at all prominent, ferrugineo-testaceous, much infuscated above, the postocular band narrowly edged above with testaceous or ferruginous, at least in the female; vertex gently tumid, feebly elevated above the pronotum, the interspace between the eyes nearly twice as wide as the first antennal joint, especially in the female; fastigium rather steeply declivous, broadly and shallowly sulcate; frontal costa almost or quite percurrent, subequal but faintly narrowed above, somewhat narrower than the interspace between the eyes, feebly sulcate or depressed at the ocellus, biseriately punctate above; eyes moderate, scarcely more prominent in the male than in the female, a little longer than the infraocular portion of the genæ; antennæ fusco-rufous, about two-thirds (♂) or three-fifths (♀) as long as the hind femora. Pronotum subequal but expanding a little on the metazona, dark fuscous, ferrugineo-testaceous below the postocular band, the disk gently convex and passing by a more or less distinct angulation, forming tolerably well pronounced lateral carinæ in the male, into the vertical lateral lobes; median carina feeble on the prozona, distinct on the metazona; front and hind margins subtruncate; prozona slightly longitudinal (♂) or quadrate (♀), a half longer than the obscurely punctate metazona. Prosternal spine rather large, erect, subconical (♂) or appressed cylindrical (♀), blunt; interspace between mesosternal lobes quadrate or a little transverse (♂) or distinctly transverse (♀), the metasternal lobes subattingent (♂) or rather distant (♀). Tegmina nearly (♂) or about (♀) as long as the pronotum, attingent, obovate, apically rounded, less than twice as long as broad, fuscous. Fore and middle femora slightly tumid in the male, ferruginous, more or less infuscated; hind femora slender, ferrugineo-testaceous, more or less heavily tinged above with fuscous, beneath flavescent; hind tibiæ dull pale ferruginous, more or less lutescent, the spines almost wholly black, 10 (♂) or 11 (♀) in number in the outer series. Extremity of male abdomen clavate, a little recurved, the supraanal plate simple, triangular, a little acutangulate, pointed, the surface nearly plane but feebly tectate with a deep median sulcus in the basal half; furcula consisting of a pair of slender parallel thorns projecting over the supraanal plate on either side of the median sulcus by no more than the length of the last dorsal segment; cerci

lamellate and rather small, as broad at base as the narrowest part of the frontal costa, narrowing but feebly and straight in the basal half, beyond bent a little upward, incurved, and tapering more distinctly to a bluntly angulate tip, and at the same time faintly torqueate and externally sulcate, the lower margin of the apical half straight, the whole falling considerably short of the tip of the supraanal plate; subgenital plate not very large, as a whole forming a pyramidal tubercle, almost as broad apically as long, the margins meeting angularly at the apex of the pyramid.

Length of body, ♂, 16 mm., ♀, 18 mm.; antennæ, ♂, 6.25? mm., ♀, 6 mm.; tegmina, ♂, 3.5 mm., ♀, 4 mm.; hind femora, ♂, 9.5 mm., ♀, 10.5 mm.

2 ♂, 1 ♀. Mary's Peak, Benton Co., Oregon, Sept., 16, A. P. Morse.

This species is most nearly allied to *M. scudderii* of the east, differing from it in the shorter antennæ and tegmina, the posteriorly subtruncate pronotum, the more curved and slightly torqueate male cerci, and the acutely pyramidal subgenital plate.

*Melanophus acutus* sp. nov.

Of small size, fusco-testaceous, flavous beneath, with a very broad fusco-piceous postocular band, at least in the male, crossing the prozona. Head not prominent, flavous or plumbeo-olivaceous, fusco-testaceous above; vertex gently tumid, scarcely elevated above the pronotum, the interspace between the eyes about half as broad again (♂) or nearly twice as broad (♀) as the basal joint of the antennæ; fastigium steeply declivous, considerably (♂) or slightly (♀) sulcate; frontal costa failing to reach the clypeus, subequal, fully as broad as the interspace between the eyes, depressed at the ocellus, biserrately punctate above; eyes moderate, very little prominent in the male, much longer than the infraocular portion of the genæ; antennæ rufous, in the female two-thirds as long as the hind femora. Pronotum subequal, fusco-testaceous, pallid below the postocular band, the disk gently convex, passing by a distinct though well rounded shoulder into the vertical lateral lobes, which are tumid on the prozona; median carina distinct, percurrent, and either equal (♀) or subdued between the sulci (♂); front margin gently convex, in the male faintly and mesially emarginate, hind margin very broadly obtusangulate, the angle sometimes rounded; prozona longitudinally quadrate (♂) or

quadrate ( $\text{♀}$ ), a half longer than the finely punctate metazona. Prosternal spine erect, cylindroconical, very blunt; interspace between mesosternal lobes fully half as long again as broad ( $\text{♂}$ ) or scarcely longer than broad ( $\text{♀}$ ), the metasternal lobes attingent ( $\text{♂}$ ) or approximate ( $\text{♀}$ ). Tegmina slightly longer than the pronotum, overlapping, apically acuminate, fusco-testaceous. Fore and middle femora somewhat tumid in the male, testaceous or fusco-testaceous; hind femora testaceous or flavo-testaceous, more or less obscurely bifasciate with fuscous, the inner and lower faces flavous, the geniculation infuscated; hind tibiæ red. the spines black in the apical half, 11-12, generally 11, in number in the outer series. Extremity of male abdomen clavate and considerably recurved, the supraanal plate triangular with acutangulate apex, the lateral margins thickened and elevated, especially in the basal half, the median sulcus rather broad and subequal, extending over the basal two-thirds; furcula consisting of a distinct fork, the arms forming a U, flattened, tapering, parallel and acuminate, crossing the basal third of the supraanal plate; cerci rather small, curved upward and scarcely inward, each formed of a compressed lamina, which tapers rapidly in the basal half to less than half the basal width, the apical half equal, apically rounded, outwardly feebly sulcate or rather dimpled; subgenital plate rather small, subconical, of equal length and width, the apical margin strongly rounded as seen from above, feebly elevated and entire.

Length of body,  $\text{♂}$ , 14 mm.,  $\text{♀}$ , 18 mm.; antennæ,  $\text{♀}$ , 6 mm.; tegmina,  $\text{♂}$ , 4.5 mm.,  $\text{♀}$ , 5 mm.; hind femora,  $\text{♂}$ ,  $\text{♀}$ , 9 mm.

2  $\text{♂}$ , 1  $\text{♀}$ . Brown's Valley, Traverse Co., Minnesota, Oct. 26, O. Lugger.

This species is closely allied to the geographically distant *M. cancri* of Cape St. Lucas, differing from it in the greater length of the tegmina and furcula, and in the form of the subgenital plate; other distinctions would doubtless appear if we possessed fresher specimens of the southern species.

*Melanoplus usitatus* sp. nov.

Of about medium size, fuscous, the male with a decided plumbeous tinge, dull flavous beneath. Head not prominent, dull olivaceous or pale testaceous, more or less heavily flecked with fuscous, especially in the female, fuscous above, with a broad postocular piceous band, sometimes edged above with pale testaceous; vertex gently convex, scarcely

elevated above the pronotum, the interspace between the eyes broad, twice ( $\delta$ ) or more than twice ( $\varphi$ ) as broad as the first antennal joint; fastigium moderately declivent, hardly sulcate; frontal costa subequal, fading before the clypeus, a little narrower than the interspace between the eyes, depressed at the ocellus, irregularly punctate throughout; eyes moderate, a little prominent in the male, a little longer than the infraocular portion of the genæ; antennæ castaneous, luteous at extreme base (broken in the only specimens seen). Pronotum subequal ( $\delta$ ) or distinctly and steadily enlarging posteriorly ( $\varphi$ ), fuscous, with a very broad postocular piceous band on the prozona, below which the lateral lobes are pale testaceous, the disk transversely convex, and on the prozona slightly tumid, at least in the male, passing by tolerably distinct but blunt lateral carinæ into the slightly tumid subvertical lateral lobes; median carinæ distinct, equal, percurrent ( $\delta$ ) or obscure, subobsolete between the sulci ( $\varphi$ ); front and hind margins subtruncate; prozona distinctly longitudinal ( $\delta$ ) or subquadrate ( $\varphi$ ), fully ( $\delta$ ) or less than ( $\varphi$ ) a half longer than the scarcely punctate metazona. Prosternal spine rather short and stout, appressed, rounded conical, very blunt; interspace between mesosternal lobes nearly twice as long as broad ( $\delta$ ) or transverse, as broad as the lobes ( $\varphi$ ), the metasternal lobes approximate ( $\delta$ ) or rather distant ( $\varphi$ ). Tegmina nearly or quite as long as the pronotum, subattentgent, at least in the male, subovate, nearly twice as long as broad, apically acuminate or subacuminate, fusco-testaceous. Fore and middle femora somewhat tumid in the male, flavous or testaceous, infuscated above (hind legs lost in specimens seen). Abdomen strongly carinate, the sides strongly infuscated, the extremity in the male a little clavate, slightly recurved, the supraanal plate triangular, the tip slightly acutangulate, the surface nearly plane, with a very shallow, regularly narrowing, percurrent median sulcus between slight walls; furcula consisting of very slight, depressed, a little divergent, triangular denticles; cerci rather coarse, subtriangular, about half as long again as basal breadth, the lower margin straight, the upper sinuous, the apex blunt acuminate and feebly incurved, the lower half of the apical half faintly sulcate externally; subgenital plate rather small, subpyramidal, of equal breadth throughout, slightly flaring and apically compressed to form a pyramidal tubercle.

Length of body,  $\delta$ , 20 mm.,  $\varphi$ , 21.5 mm.; tegmina,  $\delta$ , 5 mm.,  $\varphi$ , 6 mm.

1♂, 1♀. Corvallis, Benton Co., Oregon, May 23, June 9, A. B. Cordley (A. P. Morse).

Its peculiar cerci make the species an aberrant member of its series.

#### BORCKII SERIES.

The species described since the publication of my Revision, together with those here made known, double the number of forms belonging to this series and this necessitates a new arrangement of the material, though without much disturbance of the former table, since most of the species follow at the end of the previous list. They may be separated as follows:

##### TABLE OF THE SPECIES IN THE BORCKII SERIES OF MELANOPLUS.

*a*<sup>1</sup>. Subgenital plate of male more or less elevated posteriorly, with high basal margins, but with no distinct apical tubercle.

*b*<sup>1</sup>. Posterior margin of pronotum not mesially emarginate; tegmina attингent or approximate.

*c*<sup>1</sup>. Attenuated portion of male cerci hardly more than half as long as basal expanded tapering portion.

*d*<sup>1</sup>. Interspace between mesosternal lobes of female strongly transverse; lateral carinæ of pronotum rounded so as to be subobsolete; postocular piceous band generally distinct, complete, percurrent.

*pacificus* Scudd.

*a*<sup>2</sup>. Interspace between mesosternal lobes of female subquadrate or feebly transverse; lateral carinæ of pronotum distinct; postocular piceous band generally obsolete or wholly wanting, and, even when distinct, wholly confined to the prozona..... *borckii* Stål.

*c*<sup>2</sup>. Attenuated portion of male cerci nearly or quite as long as expanded basal portion..... *punctus* sp. nov.

*b*<sup>2</sup>. Posterior margin of pronotum mesially emarginate; tegmina distant, lateral.

*c*<sup>1</sup>. Color testaceous with feeble or no postocular dark belt.

*tenuipennis* McNeill.

*c*<sup>2</sup>. Color dark fuscous with distinct and broad postocular band, at least in the male..... *missionum* Scudd.

*a*<sup>2</sup>. Subgenital plate of male distinctly tuberculate at tip, the basal margin not greatly elevated.

*b*<sup>1</sup>. Tegmina distinctly shorter than the pronotum, short ovate, attингent or approximate, rarely distant, apically well rounded.

*c*<sup>1</sup>. Hind tibiae blue; male cerci distinctly arcuate or sinuate.

*d*<sup>1</sup>. Tegmina more or less widely separated, rarely attингent; inter-

space between mesosternal lobes of male twice or nearly twice as long again as broad; cerci not finely acuminate at tip.

*fuscipes* McNeill

*d<sup>2</sup>*. Tegmina attingen; interspace between mesosternal lobes of male only slightly longer than broad; cerci tapering, rather regular, subfalcate, finely acuminate at tip.....*scitulus* Scudd.

*c<sup>2</sup>*. Hind tibiæ red; male cerci very simple and straight, hardly incurved.

*d<sup>1</sup>*. Slender forms. Male cerci equal and very slender in distal third or more, about one-third as broad as the extreme base.

*islandicus* Blatchl.

*d<sup>2</sup>*. Stouter forms. Male cerci very stout and broad, tapering throughout apical half and very bluntly rounded at apex.

*truncatus* sp. nov.

*b<sup>2</sup>*. Tegmina longer than the pronotum, elongate, overlapping or attingen, apically acuminate.

*c<sup>1</sup>*. Slender forms. Pronotum feebly angulate behind, the median carina percurrent, subequal; tegmina attingen, in one plane, no longer or scarcely longer than the pronotum; hind tibiæ green; interspace between mesosternal lobes of male twice as long as broad.

*phætaliotiformis* sp. nov.

*c<sup>2</sup>*. Stouter forms. Pronotum distinctly angulate behind, the median carina subobsolete between the sulci; tegmina overlapping, in two planes, one represented by the anal area, the other by the remainder, fully as long as, generally much longer than, the pronotum; interspace between mesosternal lobes of male quadrate or subquadrate.

*d<sup>1</sup>*. Male pronotum scarcely expanded on the metazona; tegmina but little longer than the pronotum; apical half of male cerci very slender, slenderer than the antennæ.....*incultus* sp. nov.

*d<sup>2</sup>*. Male pronotum considerably expanded on the metazona; tegmina fully half as long again as the pronotum; apical half of male cerci relatively stout, as large as the antennæ .....*huroni* Blatchl.

*Melanoplus pinctus* sp. nov.

Plate VII., Figure 7.

Rather small, the female often considerably the larger, testaceous much marked with fuscous, dull flavous beneath. Head slightly prominent, at least in the male, flavo-testaceous, much and delicately mottled with pale fuscous, or above with darker fuscous, with a dark fuscous postocular stripe; vertex gently convex, faintly elevated above the pronotum, the interspace between the eyes as broad (♂) or nearly twice as broad (♀) as the first antennal joint; fastigium steeply

declivent, distinctly (♂) or scarcely (♀) sulcate; frontal costa fading far before the clypeus, subequal, fully as wide as the interspace between the eyes, depressed at the ocellus, punctate throughout; eyes, especially in the male, rather large and somewhat prominent, very much longer than the infraocular portion of the genæ; antefnæ luteo-testaceous, sometimes castaneous, luteous toward the base, in both sexes about half as long as the hind femora. Pronotum subequal, short, in the female expanding a little on the metazona, the disk varying from fusco-testaceous to dark fuscous, edged laterally with pale testaceous, at least on the prozona, the lateral lobes with a more or less distinct, glistening fuscous, postocular band on the prozona, on the metazona becoming plain fuscous, sometimes in the female tinged with ferruginous, the lobes below pallid testaceous more or less dotted with fuscous or infuscated, and narrowly edged throughout with pallid testaceous; disk nearly plane, passing by a rounded shoulder, in the female forming faint blunt lateral carinæ, into the subvertical lateral lobes; median carina moderately distinct and coarse, subobsolete between the sulci; front and hind margins almost truncate; prozona feebly arched longitudinally, longitudinal, about a fourth or a fifth (♂) or a third (♀) longer than the rather heavily punctate metazona. Prosternal spine rather small, erect, conical, not very bluntly acuminate; interspace between mesosternal lobes more than twice (♂) or less than half (♀) as long again as broad, the metasternal lobes attingent (♂) or approximate (♀). Pleura piceous or fuscous with a pale flavous oblique stripe. Tegmina a little shorter than the pronotum, attingent or slightly overlapping, broad ovate, hardly angulate apically, much less than twice as long as broad, fusco-testaceous. Fore and middle femora somewhat tumid in the male, pale olivaceo-testaceous flecked with fuscous; hind femora rather slender, pale testaceous, confusedly trifasciate externally with blackish fuscous, pale orange beneath, the genicular arc fuscous; hind tibiæ blue, a little paler next the base and along the spiniferous margins (or at least the external one), the spines pallid on basal, fuscous on apical half, 9-10 in number in the outer series. Abdomen strongly carinate, pale testaceous, flavescent beneath, the sides more or less belted with piceous, the extremity in the male clavate, a little upturned, the supraanal plate triangular, acutangulate, nearly plane except for the somewhat prominent and sharp ridges which bound the percurrent median sulcus, and which suddenly divaricate basally; furcula consisting of a pair of hardly

noticeable attingent projections of the last dorsal segment; cerci tumid obpyriform, consisting of an ovate tapering basal bulb and an apical, scarcely tapering, blunt finger of equal length, the latter gently incurved and just failing to reach the tip of the supraanal plate; subgenital plate narrow and rather small, the lateral margin of each side elevated basally to twice the normal height to form a rounded lobe, and the apical margin elevated to form a lesser blunt triangular lobe as seen from behind.

Length of body, ♂, 15.5 mm., ♀, 21 mm.; antennæ, ♂, 5.5 mm., ♀, 7.5 mm.; tegmina, ♂, 4.25 mm., ♀, 5 mm.; hind femora, ♂, 10.5 mm., ♀, 14 mm.

7 ♂, 7 ♀. San Diego, July 22; Point Loma, July 23; and Coronado, San Diego Co., California, July 24, A. P. Morse.

This species is nearest the larger *M. borekii* and *M. pacificus*, differing mainly in the longer apical finger of the male cerci.

*Melanoplus islandicus.*

*Melanoplus islandicus* Blatchl.! Psyche, VIII., 196-197 (1898).

*Melanoplus abortivus* Walk.! Can. Ent., XXX., 90-92 (1898).

Described by Blatchley from Les Cheneaux Islands, Michigan, and by Walker from DeGrassi Point, Lake Simcoe, Ontario, and Aurora in the same province. Blatchley referred it to the Puer Series on my statement, but I was in error in supposing the cerci to be styliform and not to taper irregularly as they do. I introduce the species here to indicate its place in the series.

*Melanoplus truncatus* sp. nov.

Plate VII., Figure 8.

Of medium size or slightly below it, dark fuscous above, flavo-testaceous below, with a very broad piceous postocular band, which crosses the whole pronotum, but is sometimes diluted on the metazona, and with conspicuous pale flavous stripes on the metapleura and along the lower margin of the outer face of the hind femora. Head hardly prominent, plumbeo-olivaceous, varying to testaceous, more or less infuscated, at least above, and with the postocular stripe edged narrowly with dull flavous; vertex gently convex, only slightly elevated above the pronotum, the interspace between the eyes considerably broader than the first antennal joint; fastigium steeply declivous, dis-

tinctly sulcate, especially in the male; frontal costa about or hardly as wide as the interspace between the eyes, subequal, just not reaching the clypeus, faintly (♂) or distinctly (♀) sulcate below the ocellus, biseriately punctate above; eyes moderate, but little more prominent in the male than in the female, distinctly longer than the infraocular portion of the genæ; antennæ castaneous or rufous, infuscated apically, in the male about two-thirds as long as the hind femora. Pronotum rather short, faintly (♂) or distinctly (♀) enlarging from in front backward, dark fuscous above, the lower portion of the lateral lobes luteo- or olivaceo-testaceous, the disk convex, and passing by a distinct angulated shoulder forming weak lateral carinæ, into the vertical, anteriorly tumid (♂) or subvertical (♀) lateral lobes; median carina prominent, equal, percurrent; front margin subtruncate, in the male feebly flaring, hind margin subtruncate, faintly rounded, sometimes with the faintest possible median emargination; prozona feebly longitudinal (♂) or longitudinally subquadrate (♀), fully a third longer than the finely punctate metazona. Prosternal spine moderate, conical, blunt, suberect; interspace between mesosternal lobes quadrate or longitudinally quadrate (♂) or somewhat transverse (♀), the mesosternal lobes subattentgent (♂) or rather distant (♀). Tegmina a little shorter than the pronotum, separated above, elliptical, apically rounded, dark fuscous. Fore and middle femora a little tumid in the male, testaceous, more or less infuscated; hind femora rather short and thick, blackish fuscous above, the outer face black with the inferior flavous stripe already mentioned and the upper edge reddish flavous, the under surface orange and the geniculation fuscous; hind tibiæ dull or bright red, rarely luteous, the spines black almost to the base, 11-12 in number in the outer series. Extremity of male abdomen very clavate, strongly recurved, the supraanal plate subhastate with gently elevated margins, and a deep percurrent or almost percurrent median sulcus with high margins; furcula consisting of a pair of slender, tapering, parallel fingers extended over the basal fifth of the supraanal plate; cerci simple subtriangular laminæ, largest just beyond the extreme base, in one vertical plane, the upper edge nearly straight or feebly concave, the lower edge bent rounded, the apex bluntly rounded and hardly half the basal width, the whole less than twice as long as the greatest width; subgenital plate broad and broadest at base though subequal and much longer than broad, the apical margin feebly elevated and faintly tuberculate.

Length of body, ♂, 17.5 mm., ♀, 21.5 mm.; antennæ, ♂, 7.5? mm., ♀, 7.5 mm.; tegmina, ♂ ♀, 4.25 mm.; hind femora, ♂, 11 mm.

6 ♂, 1 ♀. San Francisco Mts., Flagstaff, Coconino Co., Arizona, July 31, Dr. J. L. Hancock.

This is an aberrant member of the series, bearing no close resemblance to any other species, excepting that in the unusual and striking markings of the hind femora it almost exactly repeats those of *M. femur-nigrum*, found in the same place at the same time. Its male cerci are uncommonly short and broad for a species in this series.

*Melanoplus phoetaliotiformis* sp. nov.

Plate VII., Figure 9.

Of medium size, rather elongate, fusco-testaceous, paler and often much paler beneath. Head rather prominent, plumbeous or fusco-plumbeous, more or less mottled with testaceous, above fuscous with two diverging and enlarging, sometimes obsolete, testaceous stripes, followed on either side below by a piceous postocular band; vertex very gently tumid, scarcely elevated above the pronotum, the interspace between the eyes nearly (♂) or a little more than (♀) twice as wide as the first antennal joint; fastigium pretty strongly declivit, somewhat sulcate, especially in the male; frontal costa fading before the clypeus, enlarging feebly in passing downward (♂) or considerably contracted above (♀), at the ocellus scarcely sulcate, distinctly narrower than the interspace between the eyes, sparsely punctate throughout; eyes of moderate size, a little prominent in the male, distinctly longer, especially in the male, than the infraocular portion of the genæ; antennæ luteo-castaneous or rufous, slightly infuscated apically, about three-fourths (♂) or a little more than half (♀) as long as the hind femora. Pronotum subequal but slightly enlarging both anteriorly and posteriorly, above fusco-testaceous with a plumbeous tinge, on the sides pallid testaceous, below more or less deeply tinged with plumbeous, with a plumbeo-piceous postocular band on the prozona, rarely edged above with dull testaceous, the disk gently convex and passing without angulation but only a rounded shoulder into the subvertical lateral lobes, which are slightly tumid on the prozona; median carina tolerably distinct, percurrent, subequal, but a trifle more pronounced on the metazona; front margin subtruncate, hind margin feebly convex; prozona distinctly longitudinal (♂) or longi-

tudinally quadrate (♀), about a third longer than the densely but rather feebly punctate metazona. Prosternal spine moderate, cylindrical, apically tapering, a little retrorse; interspace between mesosternal lobes twice as long again as broad (♂) or longitudinally subquadrate (♀), the metasternal lobes attingent (♂) or subattingent (♀). Tegmina slightly longer than the pronotum, attingent or slightly overlapping, ovate lanceolate, apically acuminate, twice or (especially in the male) sometimes more than twice as long as broad, testaceous or fuscotestaceous. Fore and middle femora a very little tumid in the male, luteo-testaceous marked with fuscous; hind femora luteo-testaceous, feebly infuscated externally and sometimes on the upper part of the inner face with a pair of fuscous blotches, beneath faint orange, the geniculation infuscated; hind tibiae blue, often luteous basally, with a narrow black postgenicular annulus, the spines black with pallid bases, 11-12 in number in the outer series. Abdomen testaceous above, flavous beneath the extremity in the male feebly clavate, slightly recurved, the supraanal plate hastate, acutangulate, nearly plane, with a rather pronounced median sulcus on the basal two-thirds, its walls not very prominent; surcula reduced to a pair of scarcely perceptible knobs; cerci rather slender, as broad at base as the frontal costa, tapering to less than half the breadth in the basal half, beyond nearly equal but tapering to a blunt tip, hardly incurved, and falling much short of the tip of the supraanal plate; subgenital plate small, simple, of nearly equal width and narrower than long, apically a little pinched above so as to appear faintly tuberculate, the lateral margins meeting apically in an acute angle.

Length of body, ♂, 19 mm., ♀, 25 mm.; antennæ, ♂, 8.5 mm., ♀, 7.5 mm.; tegmina, ♂, 5.25 mm., ♀, 6 mm.; hind femora, ♂, 11 mm., ♀, 14 mm.

19 ♂, 14 ♀. Gazelle, Siskiyou Co., California, Sept. 5, A. P. Morse. Since description, I have found that specimens from Brown's Valley, Traverse Co., Minnesota, sent me by Prof. Otto Lugger and which I had at first supposed another undescribed form, are of the same species.

It bears a close general resemblance to *Phoetaliotes nebrascensis volucris*. With the next species and *M. huroni*, both eastern species, it forms a group apart in the present series, having relatively long tegmina and very simple male cerci.

*Melanoplus incultus* sp. nov.

## Plate VII., Figure 10.

Of medium size, fuscous or fusco-testaceous, dull flavous beneath, with a broad postocular piceous belt reaching to the posterior margin of the prozona. Head slightly prominent, pallid testaceous (♂) or testaceous (♀) overlaid with fuscous-olivaceous, above fuscous, the upper part of the eyes and the postocular belt edged with pallid testaceous; vertex gently tumid, scarcely elevated above the pronotum, the interspace between the eyes half as wide again (♂) or nearly twice as wide (♀) as the first antennal joint; fastigium steeply declivous, very shallowly (♂) or hardly (♀) sulcate; frontal costa failing to reach the clypeus, subequal but enlarging from above downward, a little narrower, especially in the female, than the interspace between the eyes, fully sulcate at and below the ocellus, punctate throughout but especially above; eyes of moderate size, a little prominent in the male, distinctly longer, especially in the male, than the infraocular portion of the genæ; antennæ fusco-testaceous or rufous, lutescent basally, a little shorter than (♂) or about three-fourths (?) as long as (♀) the hind femora. Pronotum subequal, even in the female, the disk fusco-testaceous or fuscous, often obscurely edged laterally with testaceous, gently convex, passing by a rounded shoulder, only in the female simulating lateral carinæ, into the subvertical lateral lobes; median carina feeble, at all distinct only on the metazona and the front of the prozona, obsolete or subobsolete between the sulci; front margin truncate, hind margin very obtusangulate, the angle rounded; prozona quadrate (♀) or longitudinally quadrate (♂), about a third longer than the finely and obscurely punctate metazona. Prosternal spine moderate, erect, very blunt conical; interspace between the mesosternal lobes longitudinally subquadrate (♂) or decidedly transverse (♀), the metasternal lobes approximate (♂) or rather distant (♀). Tegmina a very little longer than the pronotum, overlapping, ovate lanceolate with pointed tips, fusco-testaceous, sometimes dotted with blackish fuscous, the limit between the anal and median areas distinctly marked with flavo-testaceous. Fore and middle femora slightly tumid in the male, flavo-testaceous more or less infuscated; hind femora more or less pallid testaceous, with a pallid pregenicular annulus and twice obliquely and rather narrowly banded with blackish fuscous, besides a blackish fuscous geniculation, more or less flav-

ous beneath; hind tibiae red, the spines black, 9-11, usually 10, in number in the outer series. Extremity of male abdomen a little clavate, a little recurved, the supraanal plate triangular, somewhat acutangulate, nearly plane, with a rather slender, percurrent, median sulcus, deep in basal, shallow and inconspicuous in apical half, bounded in basal half by moderately heavy ridges; furcula consisting of a pair of slender, acuminate, parallel fingers, extending over the supraanal plate by less than the length of the last dorsal segment; cerci slender, not nearly so long as the supraanal plate, gently and slightly incurved, at base no broader than the first antennal joint, tapering to about half the width, the apical half equal, the tip bluntly rounded; subgenital plate small, broad at base but tapering a little, and at apex narrower than long, the apex feebly pyramidal and produced to a distinct though rather slight tubercle.

Length of body, ♂, 18.5 mm., ♀, 25 mm.; antennae, ♂, 8.5 mm., ♀, 8.5? mm.; tegmina, ♂, 6 mm., ♀, 7.5 mm.; hind femora, ♂, 10 mm., ♀, 11.5 mm.

4 ♂, 2 ♀. Foothills five miles west of Fort Collins, July 10, and mountains of Larimer Co., Colorado, July 11, C. F. Baker.

This species is very closely allied to, if it be distinct from, *M. huroni* Blatchl., but appears to differ from it in its smaller size, considerably shorter tegmina, slightly slenderer cerci and less pronounced tubercle of the subgenital plate; the punctuation and the median carina of the metazona are also less pronounced.

*Melanoplus huroni.*

*Melanoplus huroni* Blatchl. Psyche, VIII, 195-196 (1898).

Described by Blatchley from La Salle Island, Michigan. I here merely indicate its place in the series.

INORNATUS SERIES.

To this series can be added one more species, sent me from Arizona by Dr. J. L. Hancock, though it differs considerably from the other members of the series. To accommodate it, the table of the species (Revision, p. 128) may be altered thus:

TABLE OF THE SPECIES IN THE INORNATUS SERIES OF MELANOPLUS.

a<sup>1</sup>. Male cerci broadly or rather broadly expanded apically; apical tubercle of subgenital plate blunt.

*b<sup>1</sup>.* Male cerci rather small and moderately slender, very far from reaching the extremity of the supraanal plate; apex of subgenital plate considerably protuberant.....*franciscanus* sp. nov.

*b<sup>2</sup>.* Male cerci large and broad, reaching the extremity of the supraanal plate; apex of subgenital plate very slightly protuberant.  
*inornatus* McNeill.

*a<sup>2</sup>.* Male cerci very feebly expanded apically; apical tubercle of subgenital plate acute .....*viridipes* Walsh, *decorus* Scudd.\*

*Melanoplus franciscanus* sp. nov.

Plate VIII., Figures 1, 2.

Of moderately large size, heavy, dark fuscous or fusco-testaceous, the female often olivaceous, olivaceo-flavous beneath, with a very broad piceous or fusco-piceous postocular band crossing the prozona. Head moderately prominent, ranging from olivaceous to testaceous, often more or less tinged with fuscous especially on summit, the upper margin of the postocular band edged with testaceous, which extends backward across the pronotum; vertex rather tumid but only a little elevated above the pronotum, the interspace between the eyes rather less ( $\delta$ ) or rather more ( $\varphi$ ) than twice as wide as the first antennal joint; fastigium steeply declivous, plane; frontal costa just failing to reach the clypeus, subequal but slightly narrowed above, about ( $\delta$ ) or hardly ( $\varphi$ ) as broad as the interspace between the eyes, very shallowly sulcate below the ocellus, biserately punctate above; eyes moderate, very feebly prominent in the male, much ( $\delta$ ) or a little ( $\varphi$ ) longer than the infraocular portion of the genæ; antennæ rufo-castaneous, lutescent basally, nearly as long ( $\delta$ ) or about two-thirds as long ( $\varphi$ ) as the hind femora. Pronotum subequal, faintly ( $\delta$ ) or distinctly ( $\varphi$ ) enlarging from in front backward, the lower part of the lateral lobes plumbeous or testaceous, the disk dark fuscous or testaceous, in the female often olivaceous (with markings described), gently convex, passing by a rounded shoulder more noticeable on the metazona into the subvertical lateral lobes; median carina percurrent, but feeble between the sulci and most pronounced on the metazona; front margin truncate, hind margin very broadly convex ( $\delta$ ) or very obtus-angulate, the angle rounded ( $\varphi$ ); prozona distinctly longitudinal ( $\delta$ ) or subquadrate ( $\varphi$ ), nearly a half ( $\delta$ ) or fully a third ( $\varphi$ ) longer than the rather densely punctate metazona. Prosfernal spine rather stout,

\* Separated as before, in Revision.

appressed cylindrical, blunt; interspace between mesosternal lobes fully half as long again as broad (♂) or subquadrate or transverse (♀), the metasternal lobes attingent (♂) or moderately distant (♀). Tegmina fully as long as, generally a little longer than, the pronotum, overlapping, obovate, acuminate, fuscotestaceous or fuscous, in some females fuscous-olivaceous, the anal area, or at least its margin next the median area, testaceous or pallid testaceous. Fore and middle femora somewhat tumid in the male, fuscous-olivaceous, sometimes testaceous; hind femora moderately heavy, flavo-testaceous, heavily trifasciate with fuscous (sometimes blended on the outer face), besides a fuscous geniculation, the lower face orange; hind tibiae coral red, the spines black nearly to the base, 11, rarely 12, in number in the outer series. Extremity of male abdomen strongly clavate, much recurved, the supraanal plate broad triangular with a subrectangulate apex, margins feebly flaring basally, and a coarse median sulcus for two-thirds or three-fourths the length, margined by low rather blunt walls; furcula consisting of a pair of minute lobes on either side of the base of the median sulcus; cerci of moderate size, gently incurved throughout, about as broad at base as the frontal costa, tapering to two-thirds that width in the middle, and again expanding to a spatulate oval tip well rounded at apex, and falling far short of the tip of the supraanal plate; subgenital plate of moderate size, the lateral margins strongly concave, being elevated a little basally and rising to the much elevated and flaring apical margin, forming here a stout, blunt, slightly depressed, ascending tubercle.

Length of body, ♂, 21 mm., ♀, 32 mm.; antennæ, ♂, 12? mm., ♀, 12 mm.; tegmina, ♂, 8 mm., ♀, 10 mm.; hind femora, ♂, 13.5 mm., ♀, 17 mm.

48 ♂, 21 ♀. San Francisco Mts., Flagstaff, Coconino Co., Arizona, July 30, Dr. J. L. Hancock.

#### FASCIATUS SERIES.

To this series there is a single addition to make, from California, which adds still more diversity to that little homogeneous group. Its position is best marked by separating it bodily from the rest in the table of the brachypterous species of this series (Revision, pp. 128-129), as follows:

TABLE OF THE BRACHYPTEROUS SPECIES OF THE FASCIATUS SERIES OF  
MELANOPLUS.

a<sup>1</sup>. Male cerci distinctly decurved apically, as well as strongly incurved. *ablutus* sp. nov.  
 a<sup>2</sup>. Male cerci in no way decurved, or if feebly (fasciatus), then they are not incurved ..... *The remaining species.\**

*Melanoplus ablutus* sp. nov.

## Plate VIII., Figure 3.

Below medium size, weak fusco-testaceous or dull, pale testaceous, more or less flavous beneath. Head slightly prominent in the male, flavo-testaceous flecked with fuscous, heavily above as a general rule, but sometimes hardly flecked at all; vertex very gently tumid, scarcely elevated above the pronotum, the interspace between the eyes somewhat broader than the first antennal joint; fastigium rather steeply declivous, distinctly (♂) or slightly (♀) sulcate; frontal costa percurrent, subequal, slightly broader than the interspace between the eyes, feebly sulcate below the ocellus, irregularly punctate throughout; eyes moderate, rather prominent in the male, distinctly longer than the infraocular portion of the genæ, particularly in the male; antennæ luteous, luteo-castaneous, or rufous, lutescens basally, more than two-thirds (♂) or a little more than half (♀) as long as the hind femora. Pronotum subequal, faintly enlarging in the posterior half, fuscous or testaceous above, with a broad postocular piceous band on the prozona, often obsolete in the female, sometimes extended, dulled, over the metazona, beneath which the lateral lobes are flavo-testaceous or subflavous, the disk moderately convex, passing without sign of lateral carinæ into the vertical or subvertical lateral lobes; median carina feeble, especially between the sulci; front margin truncate, hind margin very broadly obtusangulate; prozona longitudinal (♂) or quadrate or subquadrate (♀), one-half (♂) or nearly a third (♀) longer than the densely punctate metazona. Prosternal spine moderate, very blunt conical, a little retrorse; interspace between mesosternal lobes a little longer than broad (♂) or distinctly transverse (♀), the metasternal lobes subattentive (♂) or approximate (♀). Tegmina about as long as the pronotum, obovate, more than half as long again as broad, apically blunt angulate, brownish fuscous, sometimes obscurely dotted with blackish fuscous. Fore and middle femora slightly

\* Separated as in the Revision.

enlarged in the male, testaceous, often infuscated; hind femora pallid or flavo-testaceous, on the upper half more or less obscurely bifasciate with fuscous, the geniculation infuscated; hind tibiæ blue, often more or less pallid along the spiniferous margins, pallescent at base, with a postgenicular fuscous dot posteriorly, the spines black with pallid bases, 10-11 in number in the outer series. Extremity of male abdomen clavate, considerably recurved, the supraanal plate subhastate with acutangulate apex, broadly flaring sides and a rounded depression next the apex with raised edges, and a distinct median sulcus terminating at this depression and bounded by sharp ridges; furcula consisting of a pair of parallel minute denticulations, one on either side of the ridges bounding the median sulcus of the underlying plate; cerci moderately large, laminate, as broad at base as the subgenicular lobes of the hind femora, narrowing to two-thirds that size just before the middle and then expanding nearly as much to an elongate flap, which is a little decurved and as much incurved, its apical half tapering and bluntly rounded, reaching the tip of the supraanal plate; subgenital plate rather small, equal, almost as broad as long, apically a little compressed, the apical margin very strongly rounded, not elevated, entire.

Length of body, ♂, 14.5 mm., ♀, 19.5 mm.; antennæ, ♂ ♀, 6.5 mm.; tegmina, ♂, 4 mm., ♀, 5 mm.; hind femora, ♂, 9 mm., ♀, 11 mm.

2 ♂, 9 ♀. Wawona, Mariposa Co., California, August 13, A. P. Morse.

#### ALLENI SERIES.

To this series, heretofore represented by only two species of moderate size, from New Mexico, Dakota and Iowa, are now added two more, of small size, from California, collected by Mr. A. P. Morse. They agree closely together and are very different from the two previously known. The species may be separated as follows:

##### TABLE OF THE SPECIES IN THE ALLENI SERIES OF MELANOPLUS.

- a1. Stout and medium sized species. Median carina of pronotum more or less obscured on the prozona; hind margin of pronotum obtusangulate; tegmina as long as or longer than the pronotum; hind tibiæ generally red; male cerci relatively stout and apically angulate.
  - b1. Tegmina twice as long as pronotum; male cerci relatively long and narrow, fully three times as long as broad ..... *allenii* Scudd.
  - b2. Tegmina of about the length of the pronotum; male cerci broad and relatively short, not more than twice as long as broad ..... *snowii* Scudd.

**a<sup>2</sup>.** Slender and small species. Median carina of pronotum prominent throughout; hind margin of pronotum subtruncate; tegmina shorter than pronotum; hind tibiæ glaucous; male cerci very slender and apically rounded.

**b<sup>1</sup>.** Male cerci relatively short, not nearly reaching the tip of the supra-anal plate; apical tubercle of subgenital plate prominent. *nanus* sp. nov.

**b<sup>2</sup>.** Male cerci relatively slender and long, almost reaching the tip of the supraanal plate; apical tubercle of subgenital plate obscure.

*lignaeolus* sp. nov.

*Melanoplus nanus* sp. nov.

Plate VIII., Figure 4.

Of small size, rather slender, fuscous or fusco-testaceous, rarely testaceous, dull flavous beneath, with a broad piceous postocular stripe crossing the prozona. Head not prominent, testaceous or plumbeo-testaceous, much flecked with fuscous, especially above where it is almost wholly fuscous, the upper margin of the postocular stripe edged narrowly with testaceous; vertex tumid though elevated but little above the pronotum, the interspace between the eyes half as broad again (♂) or twice as broad (♀) as the first antennal point; fastigium steeply declivent, strongly (♂) or scarcely (♀) sulcate; frontal costa almost percurrent, subequal but faintly narrowing above, about as wide as the interspace between the eyes, faintly sulcate at the ocellus, biserrately punctate above; eyes moderate, somewhat prominent in the male, much longer than the infraocular portion of the genæ; antennæ castaneous, luteous at base, often infuscated apically, about two-thirds (♂) or hardly half (♀) as long as the hind femora. Pronotum subequal (♂) or feebly enlarging from in front backward (♀), fuscous but below the postocular stripe plumbeo-luteous, sometimes infuscated, the disk convex, passing by a faint angulation, in the female simulating lateral carinæ, into the vertical lateral lobes, which in the male are faintly tumid on the prozona; median carina distinct, percurrent, equal; front margin faintly convex (♂) or truncate (♀), hind margin very broadly convex or subtruncate; prozona strongly (♂) or scarcely (♀) longitudinal, fully half (♂) or about one-third (♀) as long again as the scarcely more punctate metazona. Prosternal spine small, subconical (♂), or conical (♀), blunt, slightly retrorse; interspace between mesosternal lobes somewhat longer than broad (♂) or decidedly transverse (♀), metasternal lobes attingent (♂) or approximate (♀). Tegmina a little shorter than the pro-

notum, subattent, ovate, with rounded subangulate tips, fuscous. Fore and middle femora a little tumid in the male, testaceous, more or less infuscated; hind femora fusco-testaceous, the outer face very obliquely marked with fuscous, sometimes wholly infuscated, subflavous beneath; hind tibiae very pale sordid glaucous, the spines black on apical half, 11 in number in the outer series. Extremity of male abdomen clavate, considerably recurved, the supraanal plate subhastate, apically strongly acutangulate, nearly plane, the lateral margins slightly raised at the base, the median sulcus pronounced, reaching only the middle of the plate, bounded by sharp and high ridges; furcula consisting of a pair of slender, slightly divaricating spines on either side of the base of the median sulcus, but little longer than the last dorsal segment; cerci slender and short, no broader at base than the first antennal joint, tapering slightly to the middle and then expanding a less amount, the apical portion forming an ovate, very bluntly pointed pad, faintly sulcate externally and failing far to reach the tip of the supraanal plate, the whole a little incurved but otherwise straight; subgenital plate small, subpyramidal, scarcely longer than broad, of equal breadth, the apical margin faintly elevated and forming a conical tubercle.

Length of body, ♂, 14 mm., ♀, 18 mm.; antennae, ♂, 5.5 mm., ♀, 4.5 mm.; tegmina, ♂, 2.75 mm., ♀, 3 mm.; hind femora, ♂, 8.5 mm., ♀, 10 mm.

27 ♂, 22 ♀. Mill Valley, Marin Co., Aug. 22; San Francisco, Aug. 19; Berkeley, Alameda Co., Aug. 21; and Baden, San Mateo Co., California, Aug. 24, A. P. Morse.

*Melanoplus ligneolus* sp. nov.

Plate VIII., Figures 5, 6.

Of small size and rather slender, testaceous, or sometimes in the female luteo-testaceous, in the former case conspicuously marked with a broad piceous postocular band crossing the prozona, and with piceous flanks to the abdomen, in the latter case preserving only feeble indications of such markings, in both flavous beneath. Head not prominent, luteo-testaceous, more or less flecked on summit with fuscous, especially in the male, in a broad median belt; vertex tumid, feebly elevated above the pronotum, the interspace between the eyes half as broad again as the first antennal joint; fastigium strongly declivit,

gently sulcate; frontal costa just failing to reach the clypeus, subequal but faintly narrowed above, about as broad as the interspace between the eyes, scarcely sulcate at the ocellus, biseriately punctate above; eyes moderate, a very little prominent in the male, very much longer than the infraocular portion of the genæ, particularly in the male; antennæ castaneous, luteous toward the base, about three-fifths (♂) or about half (♀) as long as the hind femora. Pronotum subequal, testaceous or luteo-testaceous, sometimes faintly dotted with fuscous, below the postocular band flavo-testaceous, the disk feebly convex, passing by a slight angulation into the vertical lateral lobes; median carina distinct, percurrent, equal, sometimes fuscous; front margin very feebly convex, hind margin subtruncate but with the feeblest possible angulation, often rounded in the male; prozona longitudinal, a half (♂) or a third (♀) longer than the finely and densely punctate metazona. Prosternal spine moderate, feebly conical, very blunt, erect; interspace between metasternal lobes longitudinally subquadrate (♂) or transverse (♀), the metasternal lobes attingent (♂) or approximate (♀). Tegmina a little shorter than the pronotum, attingent or subattingent, broad oval, scarcely angulated apically, testaceous or luteo-testaceous, the greater portion or all but the anal field occasionally heavily infuscated. Fore and middle femora slightly tumid in the male, luteo-testaceous, often somewhat infuscated; hind femora testaceous, the outer face often infuscated especially above, but without fasciation, the genicular arc marked with a black line, beneath more or less luteous; hind tibiæ very pale glaucous or luteo-glaucous, the spines black except at base, short, 10-12 in number in the outer series. Extremity of male abdomen a little clavate, a little recurved, the supraanal plate hastate, very acutangulate, plane or nearly plane but feebly tectiform, the median carina distinct, percurrent between sharply defined ridges; furcula consisting of a pair of minute pointed denticulations or projections on either side of the base of the median sulcus, no longer than the last dorsal segment; cerci slender, as broad at base as the frontal costa, tapering to two-thirds that width in the middle, then enlarging somewhat to form a long oval lobe, bluntly rounded apically and sulcate exteriorly, the whole gently incurved and almost reaching the tip of the supraanal plate; subgenital plate rather small, almost as broad as long, a little tumid and apically very bluntly conical, the margins, as seen from above, forming a strongly rounded curve.

Length of body, ♂, 17 mm., ♀, 21 mm.; antennæ, ♂, 6 mm., ♀, 5.75 mm.; tegmina, ♂, 3.25 mm., ♀, 4.25 mm.; hind femora, ♂, 10 mm., ♀, 11 mm.

8 ♂, 8 ♀. Berkeley, Alameda Co., Aug. 21; and Benicia, Solano Co., California, Aug. 26, A. P. Morse.

This species closely resembles *M. marginatus pauper*, but differs from it in its lighter color, apically rounded tegmina, more distinctly and sharply punctate metazona, externally sulcate male cerci and more bluntly conical subgenital plate. It is most nearly allied to the preceding species, from which it differs by its lighter colors (from which its name is derived), its shorter male cerci and blunter apical tubercle to the subgenital plate.

#### CINEREUS SERIES.

A single species has been added to this series through the collections of Mr. A. P. Morse in California. The table of the series as given in my Revision (p. 135) may be modified to include it in the group containing cyanipes and cinereus, as follows, using the initial letters of that table:

TABLE OF A PORTION OF THE SPECIES IN THE CINEREUS SERIES OF  
MELANOPLUS.

- i<sub>1</sub>*. Furcula of male narrowing uniformly or almost uniformly throughout; hind margin of pronotum very obtusangulate..... *cyanipes* Brun.
- i<sub>2</sub>*. Furcula of male with a considerable part of the apical portion equal and very slender; hind margin of pronotum moderately obtusangulate.
- j<sub>1</sub>*. Nearly uniform, with only feeble markings; lower apical angle of male cerci much produced inferiorly..... *dealbatus* sp. nov.
- j<sub>2</sub>*. Considerably diversified in color and much bespeckled; lower apical angle of male cerci but feebly or hardly produced inferiorly.

*cinereus* Scudd.

*Melanoplus dealbatus* sp. nov.

Plate VIII., Figures 7, 8.

Nearly uniform pale testaceous, with a feeble greenish tinge seen most clearly in the males and on the closed tegmina. Head rather large and prominent, flavo-testaceous or dull flavous, with a faint, broad, slightly fuscous postocular band, extending to the metazona; vertex moderately tumid, somewhat elevated above the pronotum, the

interspace between the eyes a little broader, especially in the female, than the first antennal joint; fastigium moderately declivous, broadly sulcate, but only very shallowly in the female; frontal costa rather prominent above, equal, just failing to reach the clypeus, slightly broader than the interspace between the eyes, feebly sulcate at and a little below the ocellus, biseriately punctate above; eyes large, moderately prominent, very much longer than the infraocular portion of the genæ, the front margin subtruncate; antennæ flavous, deepening in color to orange at tip, fully (♂) or much less than (♀) two-thirds as long as the hind femora. Pronotum, except for the feeble postocular band and the infuscated sulci, nearly uniform in color, subequal, expanding a little on the metazona, especially in the male; front margin truncate, hind margin obtusangulate, the angle rounded; prozona feebly convex on the disk, passing by a rounded shoulder hardly forming lateral carinæ into the vertical lateral lobes, as a whole subquadrate, very obscurely and rather coarsely punctate, scarcely if any longer than the densely and finely punctate metazona. Prosternal spine moderate, erect, conico-cylindrical, blunt; interspace between mesosternal lobes twice (♀) or many times (♂) as long as broad. Tegmina distinctly surpassing the hind femora, slender, gently tapering, apically well rounded, pale greenish testaceous, sparsely and irregularly flecked minutely with fuscous; wings a little shorter than the tegmina, pellucid, the veins greenish, infuscated about the apex. Fore and middle femora somewhat tumescent in the male, flavous, sometimes with a greenish tinge; hind femora also flavous, with no fasciation, the outer face sometimes a little infuscated, the genicular arc heavily marked in black, the genicular lobes pallid, generally marked with black spots at the base; hind tibiæ very pale glaucous, the spines pallid in the basal, black in the apical half, 10 in number in the outer series. Extremity of male abdomen somewhat clavate, upturned, the supraanal plate subclypeate, a little produced at the tip, the lateral margins a little elevated, the median carina rather slight, percurrent but weak in the middle, lying between rather broad and not greatly elevated walls; furcula consisting of a pair of basally adjacent, laterally somewhat arcuate, long and slender, depressed fingers, equal and moderately broad in the basal third, tapering by the excision of the inner margin in the middle third, and beyond equal again but only a third as broad as the base, apically blunt, reaching fully two-thirds across the supraanal plate; cerci moderately broad, compressed and

tapering considerably in the basal half, then suddenly bent inward and considerably expanded so as to be as broad apically as basally, while at the same time they are slightly twisted, sulcate and much more laminate and the lower apical angle is slightly produced, tucked beneath the pallium and just fails to reach the tip of the supraanal plate; subgenital plate of subequal breadth, feebly flaring, the lateral and apical margins in the same plane, entire.

Length of body, ♂, 28.5 mm., ♀, 35 mm.; antennæ, ♂, 11 mm., ♀, 10 mm.; tegmina, ♂, 25 mm., ♀, 28.5 mm.; hind femora, ♂, 15 mm., ♀, 18 mm.

5 ♂, 13 ♀. Ceres, Stanislaus Co., California, August 17, A. P. Morse.

The bleached appearance of this insect has suggested the name. It is very closely related to *M. cinereus* and may possibly be more properly regarded as a varietal form of that very variable species, peculiar for its color, the less abruptly and considerably twisted male cerci, and the more pronounced inferior production of their apical angle.

#### PACKARDII SERIES.

Colorado furnishes an aberrant member of this series, forming passage to the succeeding (Collinus) series. The male cerci are not bifurcate, but the lower apical angle is excessively produced and decurved, leaving an angle where an upper fork should be, to bring it in the Collinus Series in the near vicinity of *alpinus* and *infantilis*; there being, however, no fork whatever, I have thought it best to place it here and to separate it bodily from the other members of the series as follows:

#### TABLE OF THE SPECIES IN THE PACKARDII SERIES OF MELANOPLUS.

Cerci of male with the apex symmetrically or almost symmetrically rounded.  
*packardii* Scudd., etc.\*  
 Cerci of male with the lower inferior angle produced to an acuminate blade.  
*pilatus* sp. nov.

*Melanoplus pilatus* sp. nov.

Plate IX., Figures 1, 2.

Rather below the medium size and moderately slender, testaceous, marked with fuscous. Head a little prominent, luteo-testaceous, more or less flecked with fuscous, especially above, where it may be heavily

\*Separated as in the Revision, pp. 136-137.

spotted next the upper edge of the eyes and in a postocular stripe, the latter always present and subpiceous; vertex gently tumid, slightly elevated above the pronotum, the interspace between the eyes considerably broader than ( $\delta$ ) or nearly twice as broad as ( $\varphi$ ) the basal joint of the antennæ; fastigium steeply declivous, sulcate throughout, in the male deeply; frontal costa just failing to reach the clypeus, a little narrowed above the ocellus, but below fully as broad as the interspace between the eyes, shallowly sulcate at and just below the ocellus, biseriately punctate above; eyes moderate, not prominent, much longer than the infraocular portion of the genæ; antennæ testaceous-fuscous, becoming fuscous apically, a little more ( $\delta$ ) or a little less ( $\varphi$ ) than two-thirds as long as the hind femora. Pronotum moderately slender and rather short, slightly enlarging posteriorly, delicately pilose, the piceous postocular stripe crossing the prozona, but otherwise testaceous or luteo-testaceous, except that the disk may be more or less ferruginous and marked laterally by fuscous stripes; the disk is feebly convex with rounded but moderately distinct lateral carinæ; median carina percurrent but more distinct on the metazona than on the prozona; front margin faintly convex, hind margin rounded obtusangulate; prozona longitudinally ( $\delta$ ) or transversely ( $\varphi$ ) quadrate, of the same length as the scarcely punctate metazona. Prosternal spine moderate, faintly retrorse, conico-cylindrical, blunt; interspace between mesosternal lobes slightly longer than broad ( $\delta$ ) or quadrate ( $\varphi$ ), the metasternal lobes approximate. Tegmina reaching ( $\delta$ ) or failing to reach ( $\varphi$ ) the tip of the hind femora, rather slender, tapering throughout, strongly rounded at apex, testaceous with fuscous veins and a few fuscous spots in median area; wings very faintly infumate, the veins in the apical half infuscated. Fore and middle femora somewhat tumid in the male; hind femora rather slender, luteo- or ferrugineo-testaceous, the outer face almost wholly infuscated, the upper inner face sometimes twice spotted with fuscous, the genicular arc black; hind tibiæ very pale glaucous, the spines black excepting at extreme base, 11-13 in number in the outer series. Extremity of male abdomen feebly clavate, upturned, the supraanal plate triangular with raised margins, the median sulcus percurrent, very distinct, equal, its margins elevated like the lateral margins; furcula consisting of a pair of slight triangular teeth, no longer than the last dorsal segment; cerci stout and slightly bullate at base, immediately and rapidly tapering to a slender median cylinder, which expands apically

into a slightly decurved as well as incurved, triangular, elongated, apically acuminate lamina, reaching beyond the apex of the supraanal plate; subgenital plate rather small, forming a quadrangular scoop, broad at base, narrowing apically, with the apical margin suddenly and greatly elevated above the lateral margins, broadly convex above and apically externally sulcate.

Length of body, ♂, 19.5 mm., ♀, 20 mm.; antennæ, ♂♀, 7.5 mm.; tegmina, ♂, 12.5 mm., ♀, 14.5 mm.; hind femora, ♂, 11 mm., ♀, 12 mm.

1 ♂, 1 ♀. Mouth of Big South River, Larimer Co., 8000', August 3; and foothills five miles west of Fort Collins, Larimer Co., Colorado, July 10, C. F. Baker.

#### TEXANUS SERIES.

A considerable number of species are to be added to this series, all collected on the Pacific coast by Mr. A. P. Morse. Moreover, I formerly placed *M. marginatus* in the Plebejus Series instead of here, where it belongs, and to include it also it is necessary entirely to remodel the table formerly given to separate the species. As, moreover, *M. marginatus* is dimorphic, and one form is macropterous, it is necessary to find a place in the general table of the macropterous species for the Texanus Series, not heretofore represented. This is done by altering the table given in my Revision (pp. 136-137), so far as the Packardii, Texanus and Plebejus Series are concerned, in the following manner;

TABLE TO SEPARATE THE MACROPTEROUS SPECIES OF THE PACKARDII, TEXANUS, AND PLEBEJUS SERIES OF MELANOPLUS.

*a<sup>1</sup>*. Apical portion of supraanal plate of male suddenly depressed just beyond the middle; cerci broad or moderately broad, not much narrowed in the middle, more or less suddenly bent inward near tip, exteriorly sulcate at apex.....(Packardii Series).\*

*a<sup>2</sup>*. Supraanal plate of male on the same general plane throughout; cerci slender and much narrowed in the middle, gradually incurved, exteriorly tumid at apex.

*b<sup>1</sup>*. Subgenital plate of male short and broad, as broad as long, as seen from above apically angulate and tuberculate.

(*Texanus Series*) *marginatus* Scudd.

\* The separation of the species of this series is given elsewhere in the present paper.

*b*<sup>2</sup>. Subgenital plate of male narrower, apically much narrower, than long, as seen from above apically well rounded and simple.

(*Plebejus Series*) *paroxyoides* Scudd.

Dealing now with the brachypterous species of the *Texanus* Series we may remodel the table given in the Revision (pp. 129-130) as follows:

TABLE OF THE BRACHYPTEROUS SPECIES IN THE *TEXANUS* SERIES  
OF MELANOPLUS.

*a*<sup>1</sup>. Tegmina widely separated, lateral; interspace between mesosternal lobes of male more than twice as long as broad; furcula consisting of a pair of exceptionally broad and short plates..... *dumicola* Scudd.

*a*<sup>2</sup>. Tegmina subattingent, attingent or overlapping; interspace between mesosternal lobes of male less, generally much less, than twice as long as broad; furcula, when present, consisting of a pair of approximate pointed denticulations.

*b*<sub>1</sub>. Subgenital plate of male ending in a conical tubercle.

*c*<sup>1</sup>. Male cerci regularly incurved throughout..... *marginatus* Scudd.

*c*<sup>2</sup>. Male cerci sinuate as seen from above, being incurved and at tip again turned backward..... *variabilis* Brun.

*b*<sup>2</sup>. Subgenital plate of male with no pointed tubercle.

*c*<sup>1</sup>. Tegmina at most no longer than the pronotum, well rounded apically; cerci of male at tip angularly produced below, rounded above.

*d*<sup>1</sup>. Tip of male cerci angulate but not greatly produced below, this portion directed posteriorly more than inferiorly.

*c*<sup>1</sup>. Middle of male cerci scarcely half as broad as the base; furcula distinctly present though minute..... *lepidus* Scudd.

*e*<sup>2</sup>. Middle of male cerci but little narrower than the base; furcula absent..... *ascensus* sp. nov.

*d*<sup>2</sup>. Tip of male cerci not only angulate but much produced, the produced portion directed more inferiorly than posteriorly.

*e*<sub>1</sub>. Larger forms, the males exceeding 18 mm. in length; antennæ of male not exceeding four-fifths the length of the hind femora; furcula present though minute; hind femora of female red.

*f*<sup>1</sup>. Middle of male cerci nearly as broad as the frontal costa at the ocellus, and about three-fourths as broad as the base of the cerci, acuminate at tip; furcula consisting of a pair of beads only; tegmina more or less angulate at tip..... *validus* sp. nov.

*f*<sup>2</sup>. Middle of male cerci only half as broad as the frontal costa at the ocellus and from a half to two thirds as broad as the base of the cerci, the tip produced but well rounded; furcula consisting of a pair of minute thorns; tegmina rounded apically.

*algidus* sp. nov.

*c<sup>2</sup>.* Smaller forms, the males not reaching the length of 18 mm.; antennæ of male almost as long as the hind femora; furcula absent; hind femora of both sexes glaucous, very rarely red. *debilis* sp. nov.

*c<sup>2</sup>.* Tegmina longer than the pronotum, subacuminate at tip; cerci of male symmetrically rounded at apex, above and below.

*d<sup>1</sup>.* Interspace between mesosternal lobes of male hardly more than half as long again as broad; extremity of subgenital plate elevated, but not noticeably recurved ....., *batchleyi* Scudd.

*d<sup>2</sup>.* Interspace between mesosternal lobes of male nearly or quite twice as long as broad; extremity of subgenital plate elevated and considerably recurved..... *texanus* Scudd.

*Melanoplus ascensus* sp. nov.

Plate IX., Figure 3.

*Melanoplus ascensus* Scudd.!, Appal., viii., 315 (1898)—undescribed.

Slightly below the medium size, dark fuscous or fusco-testaceous, flavous beneath. Head faintly prominent, plumbeo testaceous, more or less, sometimes heavily, flecked with fuscous, above almost wholly fuscous, sometimes with a slender edging of testaceous to the postocular piceous band; vertex gently convex, a little elevated above the pronotum, the interspace between the eyes a little wider than the first antennal joint; fastigium steeply declivous, moderately sulcate; frontal costa percurrent, equal, fully as broad as the interspace between the eyes, a little sulcate below the ocellus, biseriately punctate above; eyes moderately large, a little prominent, very much longer than the infra-ocular portion of the genæ; antennæ castaneous, pallescent at extreme base, almost as long as the hind femora. Pronotum subequal, very feebly expanding on the metazona, fuscous, with a broad piceous or fusco-piceous postocular band on the prozona, beneath which the lateral lobes are plumbeo testaceous, the disk gently convex, passing by a very rounded shoulder in no way simulating lateral carinæ into the vertical lateral lobes, which on the prozona are faintly tumid; median carina distinct but slight on the metazona, feeble on the prozona, subobsolete between the sulci; front margin truncate, hind margin gently convex; prozona a little longitudinal, about a quarter longer than the rather obscurely punctate metazona. Prosternal spine moderate, erect, feebly conical, blunt; interspace between mesosternal lobes from half as long again as broad to twice as long as broad, the metasternal lobes attingent. Tegmina almost as long as the pronotum, attingent, obo-

vate, strongly rounded apically, less than twice as long as broad, fusco-testaceous. Fore and middle femora slightly tumid, dark plumbeo-testaceous; hind femora not very slender, pallid testaceous, trifasciate with fuscous so broadly as to blend through most of the femur, leaving only pallid patches in rather striking contrast to the rest, the under surface and basal half of inner surface deep orange; hind tibæ dark blue with a dark postgenicular dot, the spines black almost to the base, 11-12 in number in the outer series. Extremity of abdomen clavate, considerably recurved, the supraanal plate at base equal, beyond triangular, the apex somewhat acutangulate, the lateral margins flaringly elevated at base, the median sulcus percurrent, rather shallow, broadening apically, the walls low, especially apically; furcula wanting; cerci moderately stout, not very long, incurved throughout, at base rather broader than the frontal costa, narrowing in the middle to three-fourths the basal width, generally more by excision of the upper than of the lower margin, beyond enlarging slightly, a little decurved and ending with a rounded angulation, this apical portion more strongly incurved; subgenital plate not very large, flaring, of subequal width, and but little if any longer than broad, the lateral and apical margins in the same plane, and as seen from above forming a strong curve.

Length of body, 18 mm.; antennæ, 9.5 mm.; tegmina, 4 mm.; hind femora, 10 mm.

5 ♂. Mt. Shasta, northern California, just below the forest line, Sept. 2; Portland, Oregon, Sept. 19, A. P. Morse.

This species is more nearly allied to *M. lepidus* Scudd., from which it differs distinctly in its stouter cerci and the absence of a furcula.

*Melanoplus validus* sp. nov.

Plate IX., Figures 4, 5.

Of medium size, moderately stout, fusco-griseous, dull testaceous beneath, with a broad postocular piceous or subpiceous stripe extending over the prozona, sometimes obscure in the female. Head not prominent, dull testaceous, more or less deeply flecked and dotted with fuscous, above almost wholly fuscous or infuscated, the postocular stripe narrowly and often obscurely edged above and below with testaceous; vertex gently tumid, not or scarcely elevated above the pronotum, the interspace between the eyes fully half as broad again (♂) or twice as broad (♀) as the first antennal joint; fastigium con-

siderably declivit, broadly (♂) or scarcely (♀) sulcate; frontal costa percurrent or almost percurrent, equal or faintly narrowed above, scarcely narrower than the interspace between the eyes, scarcely sulcate below the ocellus, irregularly punctate; eyes moderately large, a little prominent in the male, somewhat longer than the infraocular portion of the genæ; antennæ dark castaneous or rufo-castaneous, often infuscated apically, about four-fifths (♂) or about two-thirds (♀) as long as the hind femora. Pronotum very feebly and gradually enlarging from in front backward, fusco-testaceous, rarely rufo-testaceous, often heavily and coarsely punctate with fuscous, dull testaceous below the postocular stripe, the disk gently convex, passing, on the metazona only and especially in the female, with the feeblest sign of any shoulder into the vertical lateral lobes, which are faintly tumid on the prozona; median carina low but distinct on the metazona, less distinct on the prozona; front margin truncate, hind margin very obtusangulate; prozona subquadrate or quadrate, a third longer than the heavily punctate metazona. Prosternal spine moderately stout, erect, slightly (♂) or distinctly (♀) conical, blunt (♀) or very blunt (♂); interspace between mesosternal lobes twice as long as broad (♂) or subquadrate (♀), the metasternal lobes subattentgent (♂) or approximate (♀). Tegmina about as long as the pronotum, overlapping feebly, obovate, subacuminate but rounded, about half as long again as broad, or, in the male, more than that, fusco-testaceous, often dotted obscurely with fuscous. Fore and middle femora considerably tumid in the male, testaceous, more or less infuscated; hind femora testaceous, heavily angulato-bifasciate with fuscous, the geniculation fuscous, the under surface dull luteo-flavous; hind tibiæ variable, pale glaucous, dull luteous more or less infuscated, or pale dull red (the last in the female only), lutescent basally, sometimes pallid along the spiniferous margins, pilose, the spines black at tip, pallid at base, 10-11 (♂) or 11-12 (♀) in number in the outer series. Extremity of male abdomen strongly clavate, considerably recurved, the supraanal plate markedly clypeate, the basal half having subparallel but gently concave sides, the apical half being triangular with more strongly concave sides and acutangulate tip, all the margins a little elevated, the median sulcus distinct and percurrent between moderate ridges; furcula consisting of a pair of the slightest possible knobs or beads on either side of the base of the median sulcus above mentioned; cerci rather large and heavy, tapering gently toward the middle, which is about as broad

as the frontal costa, then similarly expanding to a piece of about the same size as the base with the addition of a triangular plate formed by the inferior and posterior production of the lower outer angle, the apical half of the whole incurved, the apical process often bent a little inward, bluntly acuminate, and about reaching the tip of the supra-anal plate; subgenital plate moderate, flaring, of subequal breadth and almost as broad as long, the apical margin a little elevated, broadly rounded, entire.

Length of body, ♂, 21.5 mm., ♀, 22.5 mm.; antennæ, ♂, 9? mm., ♀, 8.25 mm.; tegmina, ♂, 5 mm., ♀, 5.25 mm.; hind femora, ♂, 11 mm., ♀, 12.25 mm.

74 ♂, 80 ♀. Portland, Multnomah Co., Sept. 18; Corvallis, Sept. 15, and Philomath, Benton Co., Sept. 15; Divide (Cottage Grove), Lane Co., Sept. 12; Drain, Sept. 11, Roseburg, Sept. 10, and Glendale, Douglas Co., Sept. 9; and Grant's Pass, Josephine Co., Oregon, Sept. 8. The species was described from 43 specimens, coming from Divide, Roseburg and Grant's Pass, the others having been overlooked at the time of description.

This and the two following species form a group within the series, in which the male cerci are distinctly and considerably decurved at apex.

*Melanoplus algidus* sp. nov.

Plate IX., Figure 6.

Of medium size, moderately stout, rather dark fuscous, dull testaceous beneath, with a broad piceous or subpiceous postocular band, generally more distinct in the male than in the female, terminating at the metazona. Head not very prominent, dull testaceous, often and especially in the female with an olivaceous tinge, much obscured with fuscous especially above, the postocular band generally edged narrowly above with testaceous; vertex gently tumid, distinctly though slightly elevated above the pronotum, the interspace between the eyes about half as broad again (♂) or twice as broad (♀) as the first antennal joint; fastigium steeply declivent, broadly and scarcely sulcate; frontal costa percurrent or nearly so, subequal but faintly narrowed above, scarcely narrower than the interspace between the eyes, feebly sulcate below the ocellus, biseriately punctate above; eyes moderately large, a very little prominent in the male, somewhat longer than the infraocular portion of the genæ; antennæ rufous, sometimes a little

infuscated apically, about three-fourths ( $\delta$ ) or two-thirds ( $\varphi$ ) as long as the hind femora. Pronotum very feebly and gradually enlarging from in front backward, especially in the female, rather dark fuscous or fusco-testaceous, the latter particularly in the female, dull testaceous below the postocular band, the disk gently convex, feebly shouldered; median carina distinct on the metazona, rather feeble on the prozona; front margin very faintly convex, hind margin very obtusangulate, the angle rounded; prozona longitudinally ( $\delta$ ) or transversely ( $\varphi$ ) subquadrate, generally about a third longer than the closely punctate metazona. Prosternal spine moderately large, slightly appressed cylindrical, blunt, erect; interspace between mesosternal lobes varying from less than half as long again as broad to more than twice as long as broad ( $\delta$ ) or from distinctly to very transverse but narrower than the lobes ( $\varphi$ ), the metasternal lobes attingent ( $\delta$ ) or rather distant ( $\varphi$ ). Tegmina about or hardly as long as the pronotum, attingent or in the male often feebly overlapping, broadly ovate, the tip feebly angulate ( $\delta$ ) or rounded ( $\varphi$ ), hardly more than half as long again as broad, fuscous or in the female sometimes fusco-testaceous obscurely mottled with fuscous. Fore and middle femora considerably tumid in the male, testaceous more or less infuscated; hind femora testaceous, heavily angulato-bifasciate with fuscous, the geniculation fuscous, the under surface dull flavous; hind tibiae varying from, dull glaucous to dull luteous ( $\delta$ ) or red ( $\varphi$ ), the spines black beyond the base, 10-13, generally 11, in number in the outer series. Extremity of male abdomen strongly clavate, considerably recurved, the supraanal plate clypeate with rather abruptly and considerably elevated margins, the basal half or more subrectangular, the apical portion abruptly contracted with strongly concave sides and produced apex, which with its elevated margins is the continuation of the percurrent sharp and deep median sulcus; furcula consisting of a pair of minute pointed teeth lying on either side of the base of the median sulcus; cerci rather long and not very stout, tapering from the base to the middle and then as gradually expanding to the same width, at the middle from a half to two-thirds as broad as at base and about half as broad as the frontal costa at the ocellus, the apical portion rounded, but unequally, its lower portion being considerably produced but in no way acuminate, the whole gently incurved and nearly reaching the tip of the supraanal plate; subgenital plate moderate, distinctly flaring, gradually broadening apically, where it is nearly as broad as the length,

the apical margin a little elevated, well rounded, entire, occasionally (by accident?) feebly notched.

Length of body, ♂, 19 mm., ♀, 24 mm.; antennæ, ♂, 8.5 mm., ♀, 8 mm.; tegmina, ♂, 5 mm., ♀, 5.5 mm.; hind femora, ♂, 11 mm., ♀, 12.25 mm.

36 ♂, 36 ♀. Mary's Peak, Benson Co., Oregon, Sept. 16, A. P. Morse.

This species is very closely allied to the common Oregon species of lower levels, *M. validus* just described, differing from it mainly in the slenderness and apical roundness of the male cerci and the rounded tips of the tegmina, characters which appear to be pretty constant.

*Melanoplus debilis* sp. nov.

Plate IX., Figure 7.

Of rather small size and not very stout, rather dark fuscous, dull flavo-testaceous beneath, with a broad, subpiceous, postocular band extending to the metazona. Head moderately prominent, dull plumbago-testaceous, more or less infuscated especially above, the postocular band margined with testaceous; vertex feebly tumid, scarcely elevated above the pronotum, the interspace between the eyes considerably broader than (♂) or nearly twice as broad as (♀) the first antennal joint; fastigium steeply declivit, distinctly (♂) or rather feebly (♀) sulcate; frontal costa just failing to reach the clypeus, subequal but generally a little narrowed above, especially in the male, fully as broad as the interspace between the eyes, more or less sulcate below the ocellus, especially in the male where it is sometimes sulcate throughout, biseriately punctate above; eyes moderate, considerably prominent in the male, much longer than the infraocular portion of the genæ; antennæ castaneous, often more or less infuscated, almost as long (♂) or two-thirds as long (♀) as the hind femora. Pronotum subequal (♂) or feebly enlarging from in front backward (♀), fuscous or dark fusco-testaceous, brighter or duller testaceous below the postocular band, the disk gently convex and passing by a distinct but well rounded shoulder into the vertical lateral lobes, which are feebly tumid on the prozona; median carina feeble on the prozona, distinct on the metazona; front margin faintly convex, hind margin broadly obtusangulate; prozona longitudinally (♂) or transversely (♀) subquadrate, fully (♂) or nearly (♀) a third longer than the finely punc-

tate metazona. Prosternal spine moderate, conical, erect; interspace between mesosternal lobes nearly or quite half as long again as broad ( $\delta$ ) or a little transverse ( $\varphi$ ), the metasternal lobes attingent ( $\delta$ ) or not very distant ( $\varphi$ ). Tegmina about ( $\delta$ ) or fully ( $\varphi$ ) as long as the pronotum, attingent or, feebly overlapping, obovate, apically rounded, rarely in the least degree angulate, fuscous, often flecked with darker fuscous. Fore and middle femora testaceous generally more or less infuscated, moderately tumid in the male; hind femora testaceous, broadly, heavily, and on the outer face angularly bifasciate with fuscous, sometimes sharply, sometimes obscurely, the whole geniculation infuscated, the lower face dull flavous; hind tibiæ glaucous or plumbeo-glaucous, in rare instances (of either sex) either wholly or apically red, the spines black beyond the base, 10-12, usually 11, in number in the outer series. Extremity of male abdomen strongly clavate, considerably recurved, the supraanal plate with the basal portion rectangular, the apical sharply triangular, the apex being very acutangulate, all the margins a little raised, the median sulcus heavy, percurrent, but its walls fading apically; furcula wanting; cerci moderately stout and long, tapering to the middle and then similarly expanding, the median portion three-fourths as wide as the base and as wide as the narrowest part of the frontal costa, the apical portion strongly compressed, the lower outer portion produced to a triangular, bluntly acuminate lobe, the whole incurved and failing somewhat to reach the tip of the supraanal plate; subgenital plate moderate, a little flaring, subequal in breadth and nearly as broad apically as long, the apical margin slightly elevated, rounded and entire.

Length of body  $\delta$ , 16 mm.,  $\varphi$ , 19.5 mm.; antennæ,  $\delta$ , 8 mm.,  $\varphi$ , 6.75 mm.; tegmina,  $\delta$ , 3.5 mm.,  $\varphi$ , 4.25 mm.; hind femora,  $\delta$ , 9 mm.,  $\varphi$ , 10.25 mm.

20  $\delta$ , 26  $\varphi$ . Ashland, Sept. 7, and Siskiyou, Jackson Co., Oregon. Sept. 6, A. P. Morse.

This species was taken by Mr. Morse only in the extreme southern part of Oregon, being replaced farther north, even at Grant's Pass in the same water shed, by the larger *M. validus*, which it closely resembles, differing from it, however, distinctly in size and also in the lack of male furcula, the relatively shorter cerci, the more rounded form of the tegmina, and generally in the color of the hind tibiæ of the female; the eyes of the male are also more prominent and the antennæ of the same sex relatively longer.

## PLEBEJUS SERIES.

*Melanoplus marginatus*, as already stated, should be removed from this to the Texanus Series, while to it should be added a species from New Mexico, submitted to me by Mr. Morse. The table given in my Revision (p. 130) may be thus remodelled:

TABLE OF THE BRACHYPTEROUS SPECIES IN THE PLEBEJUS SERIES OF  
MELANOPLUS.

- a<sup>1</sup>.* Apical portion of male cerci distinctly sulcate exteriorly.
- b<sup>1</sup>.* Hind margin of pronotum subtruncate or broadly rounded subangulate; interspace between mesosternal lobes of female transverse; male cerci apically truncate, mesially broad, hardly narrower than the base.  
    *calidus* sp. nov.
- b<sub>2</sub>.* Hind margin of pronotum distinctly angulate; interspace between mesosternal lobes of female at least half as long again as broad; male cerci apically rounded, mesially narrow, much narrower than the base.  
    *plebejus* Stål.
- a<sup>2</sup>.* Apical portion of male cerci exteriorly plane or tumid.
- b<sup>1</sup>.* Posterior margin of pronotum distinctly emarginate in the middle; tegmi a widely separated; male cerci elongate, surpassing the supraanal plate; subgenital plate broader at base than apically, its apical margin regularly rounded and even ..... *gracilis* Brun.
- b<sub>2</sub>.* Posterior margin of pronotum rounded truncate, with but feeblest signs of mesial emargination; tegmina attigent or subattigent; male cerci relatively brief, not surpassing the supraanal plate; subgenital plate not broader at base than apically, its apical margin angulate or tuberculate ..... *inops* Scudd.

*Melanoplus calidus* sp. nov.

Slightly above medium size, moderately robust, testaceo-olivaceous, somewhat infuscated, beneath flavo-olivaceous with a broad subpiceous postocular band crossing the metazona. Head a little prominent, dull olivaceous feebly infuscated, above more deeply, the postocular band margined with flavo olivaceous; vertex gently tumid, distinctly elevated above the pronotum, the interspace between the eyes fully half as broad again as the first antennal joint; fastigium strongly declivous, hardly sulcate; frontal costa failing to reach the clypeus, subequal, as broad as the interspace between the eyes, feebly sulcate below the ocellus, punctate throughout, biserrately above; eyes moderate, but little prominent in the male, only a little longer than the infraocular

portion of the genæ; antennæ rufous, in the female nearly three-fifths as long as the hind femora. Pronotum rather stout, expanding a little on the metazona, the disk fusco-testaceous, gently convex and passing by a distinctly angular but rounded shoulder into the vertical lateral lobes, which are dull green except for the postocular band; median carina distinct on the metazona, very feeble on the prozona; front margin subtruncate, hind margin subtruncate ( $\delta$ ) or broadly obtusangulate, the angle rounded ( $\varphi$ ); prozona a little longitudinal ( $\delta$ ) or quadrate ( $\varphi$ ), fully ( $\delta$ ) or nearly ( $\varphi$ ) a half longer than the finely punctate metazona. Prosternal spine conical, blunt, slightly retrorse; interspace between mesosternal lobes half as long again as broad ( $\delta$ ) or a little transverse ( $\varphi$ ), the metasternal lobes attingent ( $\delta$ ) or approximate ( $\varphi$ ). Tegmina slightly longer than the pronotum, overlapping, apically acuminate, fusco-testaceous. Fore and middle femora somewhat tumid in the male, olivaceo testaceous; hind femora moderately stout, clouded exteriorly with fusco-olivaceo's margined below with flavous, the inner and lower faces flavous or rosaceous, the former banded interruptedly with flavous and blackish fuscous, the geniculation blackish fuscous; hind tibiæ red ( $\delta$ ) or glaucous ( $\varphi$ ), the spines black except basally, 10 ( $\varphi$ ) or 12 ( $\delta$ ) in number in the outer series. Extremity of male abdomen clavate, considerably recurved, the supraanal plate large, clypeate, the margins scarcely elevated, the median sulcus distinct and deep, narrowing to a point a little beyond the middle, its walls low; furcula consisting of a pair of thickened disks with slight diverging points, barely extending beyond the margin of the last dorsal segment; cerci large, rather stout, quadrangular plates of subequal width, contracted slightly in the middle, the apex truncate, with its angles, and especially the lower, slightly rounded, the whole but little more than twice as long as broad, lying in a vertical plane, but a little incurved, and the outer face of the apical half a little depressed; subgenital plate not very large, moderately narrow, but the apical margin considerably elevated, rounded angulate as seen from behind, entire.

Length of body,  $\delta$ , 20 mm.,  $\varphi$ , 21.75 mm.; antennæ,  $\varphi$ , 7.5 mm.; tegmina,  $\delta$   $\varphi$ , 6 mm.; hind femora,  $\delta$   $\varphi$ , 10 mm.

1  $\delta$ , 1  $\varphi$ . Gilman's Ranch, Eagle Creek, White Mts., Lincoln Co., New Mexico, 7000 feet, August 10-16, E. O. Wooton (A. P. Morse).

## ASEMOPLUS Scudder.

To this supposedly monotypic genus, Walker has added a new species from the same general region as the type. It is wholly apterous and hence the generic description needs to be in so far modified, as well as the table of the genera in my Revision (p. 12) where the category  $A^3 b^3 c^2 d^3 e^1 f^1$  should read: Tegmina rarely absent (instead of always present); and further in the final category for *Asemoplus* (p. 14) the words "when present" should be added after the word "tegmina." The two species may be separated thus:

## TABLE OF THE SPECIES OF ASEMOPLUS.

Tegmina normally present;\* abdomen mesially striped above with yellowish; male cerci reaching as far back as the tip of the supraanal plate, slightly decurved at tip ..... *montanus* Brun.  
 Tegmina wanting; abdomen mesially striped above with black; male cerci scarcely reaching so far back as the tip of the supraanal plate, in no way apically decurved ..... *nudus* Walk.

\* They are sometimes absent from one side or the other, apparently by accident; out of fourteen specimens seen only one had them absent on both sides.

*Asemoplus nudus.*

*Asemoplus nudus* Walk.! Can. Ent., XXX., 197-199, pl. 6 (1898).

Near Sandon, British Columbia, 2600 feet, and Mt. Piron, near Laggan, Alberta, 7000 feet.

**THE HABITS OF AMERICAN CICINDELIDÆ.**

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BY H. F. WICKHAM, IOWA CITY, IOWA.

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When we consider that the tiger beetles are perhaps more general favorites with collectors than any others, it is surprising how little has been made known of their habits. A bare statement of locality, with, perhaps, a date, is all the information usually given, and an entomologist visiting a region known as the habitat of several species might well miss taking many of them through lack of knowledge of the peculiar conditions under which alone certain ones occur.

From time to time certain writers have given short notes, chiefly in the publications of local societies which are often difficult of access, on the species occurring in their neighborhood. In this way a great deal of interesting information has been handed down, but unfortunately nearly all the material of this character has referred to the beetles found in a restricted, if rich, district and the number of species whose habits have been recorded is, after all, quite far from numerous.

Since the time of Thomas Say, two papers of a revisional or monographic nature have treated the North American species of Cicindelidæ. The first, from the pen of Dr. Le Conte gave short notes as to the conditions under which some were taken, while the second, by Schaupp, added a very little more of this nature. Perhaps the tiger beetles of Kansas and the adjacent states have received more biographical attention than those of any other portion of the continent, and we find articles treating of their lives from the pens of Professors Snow and Popenoe, Dr. Williston, Messrs. Cooper, Brous, Knaus and Jones. Most of these papers came out in the Transactions of the Kansas Academy of Science. In California Mr. Dunn and Dr. Blaisdell have both contributed to "Zoë" remarks on the Pacific species. In the east, nearly all the published information refers to the forms found about the collecting grounds of the New York and Philadelphia entomologists, with here and there some scattering items from elsewhere. The chief contributors from this district are, as far as I have

been able to discover, Messrs. Leng, Liebeck, Davis, Johnson, Moffat, Schaupp and Dr. Gould. The south has been almost entirely neglected but for a chance item here and there in lists or other contributions.

All of the above writers have been consulted in the preparation of the following pages. In addition I have had the pleasure of receiving ready and valuable aid from most of our best known collectors of Coleoptera. My own travels have thrown me in contact with a large percentage of the described species of *Cicindela* and any statements not otherwise credited may be considered to rest on my own responsibility. While I have not in any case cited the place of publication of items borrowed, I have nevertheless mentioned the name of the author, except in a very few instances where the facts have been in circulation for such a length of time as to have become general property and to leave their original source in doubt. Most of the work is based on communications by letter and I desire here to record my thanks to many friends who so cordially responded to my call for assistance.

It is hoped that the article will serve as an aid to collectors who may be visiting a strange country as well as prove of interest to those who know most of our species of these most beautiful beetles only as cabinet specimens. It may also answer to show what we still lack in knowledge of certain forms.

*Amblychila cylindriformis* Say. This species is said, by Professor F. H. Snow, to hide during the day in burrows, especially those made by the Kangaroo Rat. Soon after sundown they come forth to hunt over their favorite grounds, the sloping clay-banks of western Kansas. They are slow in movement and appear to have no keen sense of sight, trusting apparently to stumbling on their prey which consists of various insects, particularly the Orthoptera and Lepidopterous larvæ. Mr. H. A. Brous says that they feed also on effete matter.

*A. baroni* Rivers. I have seen only one specimen of this. It was taken by Dr. Edw. D. Peters, Jr., from beneath a log lying in a rather damp spot by a small mountain stream which follows a road in the Pinal Mountains, north of Tucson, Arizona, June. Mr. Chas. Fuchs writes me that the type was collected by O. T. Baron in Pima Co., Arizona, at an elevation of 5000 feet. It was found dead in a cañon.

*A. picolomini* Reiche. From Mr. Fuchs I learn that River's specimens of this insect were taken at Peach Springs, Arizona. The Cali-

fornian entomologists lean towards the belief that there are three species of *Amblychila*, concerning which contention see *Zoë*, Vol. IV., 1893, pp. 222 *et seq.*

*Omus dejeanii* Reiche. This is confined more particularly to the north Pacific coast region and is to be found during the day under logs in the forests. By breaking up very rotten fallen trunks of trees, the insect may sometimes be obtained in numbers. The Rev. Geo. W. Taylor (Can. Ent., 1886) writes that it may often be seen on roads, wandering about as if in search of prey. I have taken it in June and July.

*O. edwardsii* Cr. Placer and Sierra Co's., California July and August (Fuchs).

*O. audouinii* Reiche. In habits and time of appearance this species resembles *O. dejeanii*, but seems rather more partial to open spots. Near Victoria, B. C., I have taken it quite commonly under logs washed up on the open beach. Near Portland, Oregon, it was tolerably common about logs in the parks and woods.

*O. submetallicus* Horn. "The published locality, Eldorado County, California, as well as the time, June, is incorrect. Mr. James Behrens found the type specimen personally, in the mountain regions of Sierra Co., California, in September. I received this notice from Mr. Behrens himself" (Fuchs, *in litt.*). I have heard of a specimen being taken in the state of Washington.

*O. hornii* Lec. "My male specimen was collected in northern Mariposa Co., California, in June, at an elevation of 2200 feet." (Fuchs, *in litt.*)

*O. californicus* Esch. "San Francisco, Alameda, Marin and Mendocino Co's., California Very common on the foot-hills from January to May." (Fuchs, *in litt.*)

*O. sequoiarum* Cr. "Tuolumne Co., California, on edges of meadows, July and August." (Fuchs, *in litt.*)

*O. ambiguus* Schaupp. "The original type, which I have in my collection, was collected in the Mount Shasta district. No particulars." (Fuchs, *in litt.*)

*O. lecontei* Horn. "Monterey Co., April." (Fuchs, *in litt.*)

*O. levius* Horn. "A female was taken on the Tule River, Tulare Co., California, in June. Mr. W. G. W. Harford collected two speci-

mens at Lambert's Soda Springs, Tuolumne Co., eleven miles from the base of Mt. Conners, near the borders of the meadows." (Fuchs, *in litt.*).

*Tetracha carolina* Linn. During the day this species may be found under stones or logs in rather open damp places. It seems to have a great fondness for the vicinity of water, being frequently met with in extremely muddy situations, even resting in the cracks of sun-baked clay which has "caked" on the surfaces of mud-pools. At night it roams about in search of prey and may be taken freely at light. In Arizona I have seen dozens of them about gas-lamps during the earlier hours of darkness. It is very widely distributed, occurring in the West Indies, South and Central America, and extending its range from the Atlantic to the Pacific in the southern United States. My specimens were all captured in July and August.

*T. virginica* Linn. Has much the same habits as the preceding. I have found it under stones along the banks of water-courses, and it is said to come in great numbers to street lamps in the southeastern states. I took it at Nashville, Tennessee, in August.

*Cicindela pilatei* Guér. Said to be found in woods in the lake region of Louisiana and Florida, coming sometimes to camp-fires at night. The variety *belfragei* Sallé has been found commonly near Salina, Kansas, by Mr. A. W. Jones, who has taken it by overturning hay-cocks in fields at an altitude of less than fifty feet above the Smoky Hill River bottom. He says that it is seldom seen during the heat of the day, but appears in the roads about four o'clock in the afternoon, and, like *Tetracha*, is crepuscular (Bull. Bklyn. Ento. Soc., VII., p. 75). Prof. E. A. Popenoe writes me that he has taken the species on dry loam soils in cornfields at cultivating time in Riley County, Kansas. It occurred on reasonably clean ground, not in swarms but straggling. Mr. Hugo Soltau collected it near Covington, Louisiana, by using a lantern.

*C. celeripes* Lec. A wonderful little species, almost indistinguishable from a large ant when running. It was taken in abundance at one time by Prof. Popenoe, at one limited locality in Riley County, Kansas. The soil was dry, sandy loam, covered with short-cropped grass and was open prairie land. My own experience with the insect is rather limited. Several years ago I took one specimen among short grass by a little stream near Iowa City. This summer (1898) I found

a few more, one July day, near the upper end of a deep gully, washed in clay soil by the rains a mile west of town. The time was about four o'clock P. M., and the little fellows were apparently at rest in the shade of the high bank, one pair in copula. At Council Bluffs, on the Missouri River, I had a few hours to spare between trains while on my way to Denver in June, 1897, and went up the high clay hills just back of the town, following one of the numerous paths. Near the top of one of these bluffs I noticed a *C. celeripes* run across the path, and careful work in the way of frightening them out by disturbing the scattered grass-clumps (under which they seem to lie) was rewarded by the capture of six or eight examples. They seemed to make instinctively for cover and at this time of day — it was just after noon and very sunny — were so wonderfully agile that in spite of inability to fly the chances of escape were many. On my return about a month later I spent a short time, near the end of the afternoon, at the same spot and found a few more. It is evident that the insect is not entirely crepuscular in habit, though I had thought it might be partially so.

The variety *cursitans* Lec., has been taken by Mr. Hugo Soltau at Covington, Louisiana. He found it in abundance on yellow sand in open timber a little way from the banks of a small stream. I have one specimen which was taken by my brother, climbing a steep bank along the Iowa River near Iowa City.

*C. obsoleta* Say. Has been taken, with its varieties, by Prof. E. A. Popenoe in Meade County, Kansas, on roads or prairies of loamy or clayey soil. It occurs in a straggling manner, not in companies, and is shy. Short growth of vegetation does not repel it, but it prefers bare ground. Mr. Roland Hayward took the variety *multurina* Lec., at Durango, Colorado, between July 25 and August 8, and in the San Juan Valley, Taos County, New Mexico (4500 feet), between August 1 and 4. It occurred on adobe soil on the plains, among the sage-brush and greasewood, scattered or singly. I found an example of the variety *prasina* Lec., at Seligman, Arizona, in July. It was out on the dry open prairie in the brush. Mr. Knaus has it from dried-up beds of lakes and pools near Coolidge, Kansas, August 12.

*C. unipunctata* Fabr. This rather rare species I have met with only once — on a dark rainy day at the end of May, in Cedar County, Iowa. I had been collecting along the river bottom and saw this

specimen run across the path into the dead leaves by the side of it. Mr. Nathan Reist informs me that he takes it in July near York Furnace, Lancaster County, Pennsylvania, on little paths running through wooded hills along the river. He says that instead of flying it creeps under leaves and stones and is easily captured, though occurring only singly or in pairs and not in company with any other species. Mr. Geo. A. Ehrmann of Pittsburg, Pennsylvania, has given me the following interesting data concerning his experience with this species, which he finds only at Brown's Wood, near his home, between June 25 and July 28: "It is found only in uplands, always in the densest part of the woods, concealed along the hard trodden paths where the color of the insect corresponds with the ground. The edges of the paths are usually lined with a scanty growth of grass, intermingled with dry leaves, sticks and stones. It is the most difficult insect I ever hunted, and is, in my estimation, only caught by chance. It occurs only singly, and depends on its swiftness of foot for escape. I never take it except on the calmest and sunniest days; when hunting in localities where I know they are found I move carefully along the paths with my sight centered six or eight feet ahead of me, ever alert for the least motion. The instant I perceive a movement like the faintest shadow I drop onto the spot with one of my hands and nine times out of ten secure the object. But three times out of the nine I catch either a spider or a shadow—the latter has usually disappeared when I look for it. It is out of the question to take *C. unipunctata* with a net."

Mr. H. W. Wenzel says it is nocturnal.

*C. longilabris* Say. I found it at Bayfield, Wisconsin, in paths or roads running through woods, during the months of June and July. It was seen but rarely and frequented spots where the ground was beaten hard. Dr. J. L. Le Conte says that it frequents paths in grassy and bushy places, taking refuge in herbage if disturbed. The variety *laurentii* Schpp., is rather abundant in some parts of the Rocky Mountain region of Colorado. I took it at Georgetown and Ouray on stony banks or in roads and paths at some distance from water during the months of June and July. As a rule it is not wild and may be captured with little difficulty, even without the use of a net. If disturbed it usually flies rather heavily and for a short distance only, so as to be readily tracked if it escapes the first time. *C. perviridis* Schpp., is found in the same situations as *C. laurentii* and appears to have the same habits. It is, however, also of wider range, Mr. Chas.

Fuchs writing that he has the type from Placer County, California. It was taken in August. The black form called *montana* Lec., seems much more entitled to specific rank; it is to be taken on alkaline flats among scant vegetation near Laramie, Wyoming. Prof. Bruner sent me some that he got at Pocatello, Idaho. My observations at Laramie go to show that it is not an abundant species but rather easy of capture as it runs about on the scantily covered surface of the flat. Dr. Williston took it at various localities in southern Wyoming early in spring, more frequently along hillsides and not especially on bared ground.

*C. scutellaris* Say. This extremely variable species is partial to dry sandy spots where there is comparatively little vegetation. The type form I have taken in Colorado (at Cañon City and Denver) on open sandy flats not in the immediate vicinity of water. In the latter locality I found it on vacant lots within the city limits during the month of June. The Cañon City specimens were found about the middle of May. Mr. Ernest J. Oslar writes that he has found it among the foot-hills at the mouth of Bear Creek Cañon, Jefferson County, Colorado, from April 15 to May 10. The flight is rather weak and slow. The form *unicolor* Dej., was seen in abundance by Mr. Soltau in sandy roads and dry runs at Spring Hill, a suburb of Mobile, Alabama, occurring early in spring and again late in the fall. Mrs. A. T. Slosson observed it flying and lighting in sandy paths through the scrub of Florida. Mr. Os'ar reports it from the same localities as cited above for his captures of *scutellaris* and adds Boulder County, Colorado. He finds it double brooded, the first occurring from April 25 to May 30, the second in September, not uncommon, but hard to catch. The black form with lateral spots, *modesta* Dej., has been found in the vicinity of New York City. "Flies on sand dunes from April, when the first brood appears. Rare during the summer, more abundant on the appearance of the second brood in the fall" (Davis). Mr. Johnson writes, "First brood in June. Occurs on sandy spots where grass and weeds are frequent, not on bare sand hills." Mr. Kemp takes it in a variety of situations near Clementon, Woodbury and Westville, New Jersey, where it is locally abundant on sandy paths by edges of woods, and also in open fields. *C. nigrior* Dej., in which the lateral spots are wanting, was taken by Mr. Johnson in company with *modesta*. Mr. Soltau reports it with *unicolor* from Spring Hill, Alabama. The green and spotted *rugifrons* Dej.,

is also said by Mr. Johnson to consort with *modesta* so that the wonderful color-variation is evidently not due to any climatic conditions in spite of the fact that certain types are more or less characteristic of certain localities. *C. lecontei* Hald., is the form most abundant in the Mississippi Valley. I have taken it rather commonly at Iowa City and Independence (Iowa), where it always occurs on dry, deep sand, quite away from water. The only difficulty attending their capture is the avoidance of sand burrs which flourish in just such conditions as are most favored by the beetles. The flight is short and weak. It is double brooded, the first brood appearing in April, the second in August and September. On one occasion I found the fall brood in countless swarms along a sandy road just south of Iowa City, but have never since seen it more than fairly abundant in that neighborhood. Mr. Knaus has found it sparingly at Manhattan and near Medora in Kansas and near Superior, Nebraska, at the two last places in company with typical *scutellaris*. He finds it always in sandy localities. Mr. Knab reports it from Hennepin, Illinois. Many Canadian records are extant, but as far as I can ascertain this form is always confined to sandy dry spots. Mr. Edw. D. Harris states that *rugifrons* and *modesta* are very sensitive to wind, disappearing on the appearance of the least breeze.

*C. pulchra* Say. "Extremely abundant in southwestern Kansas and southern Colorado. They always choose perfectly bared spots of loam on high ground and for that reason are oftenest seen along unused roads. Abundant in the valley of the Smoky Hill River, extending nearly as far east as Fort Hays," (Williston). Mr. Knaus has it from near Wallace and Coolidge; at the latter place he took one on July 27, but writes that it is usually found in May and June. Professor Snow considers late summer and fall the best collecting time. Professor Townsend took it near Navajo Springs, Arizona, and writes "I found it in the dry sandy road, white sand, I think, no water near. I also got it on red bare soil about the same color as the insect, being an iron red." This was on July 24. Mr. Oslar has captured it in the foot-hills at Chimney Gulch, Douglas County, Colorado, between May 7 and July 1. He considers it hard to capture, local, and rare.

*C. sexguttata* Fabr. In the vicinity of Iowa City this species is found chiefly about wood-roads, though sometimes seen on sidewalks within the corporate limits. Occasionally takes shelter under chips and pieces of wood which may be lying about. Rather easy to capture

since it takes flight less readily than usual. Said to occur in cotton-fields in Mississippi. Mr. Edw. D. Harris has taken a dark olivaceous-green variety of which he writes me as follows: "I took four specimens in all. The type in that locality—Litchfield County, Connecticut,—is found at lower levels but not in profusion. All these individuals [of the variety] were taken at an elevation of 1000 or 1200 feet, in open road, not where the type is apt to be found, and were more sluggish than *6-guttata*. It was evidently not common, for during the entire month of August I took but four, and these singly in widely separated localities. The point which I should wish to emphasize is that neither of the specimens were taken in localities where the type might be expected. In the cabinets of the American Museum of Natural History Mr. Beutenmüller has a specimen taken last summer [1897] in the mountains of North Carolina. There is no doubt of the species, but I have wondered if others had met with this variety in high grounds and to what extent it prevails." Further notes on this form are desirable and I shall be pleased to hear from any one who has taken it. *C. violacea* Fabr., the variety in which spots are entirely lacking, seems to have been the subject of no printed notes regarding habits, but I hear from Mr. Warren Knaus that in Kansas it is found sparingly along wood-paths and roads. It is not easily taken. Specimens are usually green, a few being deep blue. He has it from Manhattan, Onaga, and the vicinity of Benedict. *C. patruela* Dej., where the spots unite to form a more or less complete median band, seems common in Pennsylvania. Mr. Nathan Reist takes it at Chiques Rock, Lancaster County, on wooded river hills where the soil is a mixture of gravel and loam, well overgrown with grasses and ferns. It occurs in company with the type and is quite abundant but not very wary. He finds it sometimes under leaves, when it can be captured with the bare hand. The first brood is found in May, the second during early September. Mr. Geo. Ehrmann met with it but once at Pittsburg, on a stony, barren hillside; it was seen by him in numbers, however, at Cresson, Cambria County, on the summit of the Alleghenies. Mr. S. T. Kemp furnishes the following note on the blackish variety, *C. consentanea* Dej.: "I find it inhabiting the edges of a good-sized piece of woods on dark soil, also on bare spots in the same woods. It is very wary, and when disturbed, seems to take a longer flight than the other species. The timber is on higher ground than the surrounding country. Atco, New Jersey, September. Rare."

*C. purpurea* Oliv. In grassy places by roads or in paths through meadows. It is known to hibernate. At Bayfield, Wisconsin, I found it in sandy roads through pine forests in July. Mr. Kemp finds it in May and September on darkish sandy ground along edges of timber in the vicinity of Atco, New Jersey. The black race, *audubonii* Lec., is taken by Mr. P. C. Truman at Pierre and Volga, South Dakota. He writes that it is less rare at the former place and is confined, so far as his observation goes, to high grassy prairies in a light clayey loam soil where some sand is present, never frequenting a heavy clay soil nor spots where it is at all damp. It is not gregarious, no more than two or three being seen together, and, though occasionally found with or near *purpurea* and *vulgaris*, the association always seemed accidental. He has not been able to find any spring brood, always taking the species after August 25 (though I had one in my own collection from Brookings, South Dakota, with the date April 18), and it seems most plentiful in September, continuing until hard frosts. To find it he goes out on warm, still afternoons, slowly following some little-used country road through or near unbroken prairie where grass is thin and short. Thus an occasional individual is scared up, and flying a short distance, alights again in the bare track or among the adjacent grass. Mr. Knaus has "a single specimen only, taken in August, six miles north of Salina, Kansas, along red clay roadside in company with *purpurea* and *splendida*." Dr. Williston met with it abundantly in early spring. He found it most commonly in open clayey bottoms of ravines near the chalk washes on the Laramie plains, Wyoming. In Colorado, Mr. Oslar has found it occurring "pretty generally over the foot-hills" about the end of March. *C. graminea* Schaupp, the green form, was described from Kansas and California. I took it at Denver, on a vacant lot, in June, and Mr. Oslar finds it well distributed over the foot-hills at the same time as the preceding variety. There are two broods. At Volga, South Dakota, Mr. Truman takes *graminea* abundantly, some of the specimens running closely into the type form of the species. He wrote that it is "double-brooded, being seen in May and June and again in August and September. It delights in company, congregating with *purpurea*, *vulgaris*, *repanda* and *guttata* on sandy lake shores and in sandy pits and cuttings. I have oftenest found it on the margin of one of our small lakes, along the side bounded by a wooded bluff. Have also taken it on an old prairie road occasionally, but that seemed not

its usual habitat. Perhaps *graminea* has less right to a name than *audubonii*; for while the latter seems almost entitled to specific rank, always distinct in color and habits from the other varieties, *graminea* with me is always found with *purpurea*, has the same habits and gradually shades off in color to and from the type." *C. cimarrona* Lec., is a form apparently confined to the Rocky Mountain region in Colorado and New Mexico. Prof. Popenoe tells me that it occurs singly on bare clay soils about open prairies in South Park, Colorado. The variety *decemnotata* Say, is more widely scattered. Dr. Williston writes that it has habits somewhat similar to those of *montana*, being specially distributed in southern Wyoming on high grounds among the buffalo grass. Mr. Oslar informs me that he finds it abundant on certain lots in Denver, April 15th. In the foot-hills he gets it occasionally, later in the season. However, the specimens sent me prove to be *denverensis* Casey, which must belong with the aggregate now ranking as varieties of *purpurea*. The variety *limbalis* Klug, is quite abundant at Iowa City, chiefly on steep, bare banks (whether of sand or clay) by roadsides. It appears with the first warm days of spring and is more readily captured than most of our tigers. In Colorado, Mr. Oslar finds it in the dry bed of Cherry Creek near Denver. It appears there the first week in April. The names *spreta* Lec., and *amœna* Lec., are applied to forms which I have never seen and regarding whose occurrence I can get no information. That called *splendida* Hentz, is more or less abundant in Kansas. Prof. Popenoe took it in Riley and Shawnee Counties, in February, March, April and September on dry clay banks exposed to the sun, along roadsides or in gullies through the prairies. It is rather plentiful but straggling in its occurrence. Mr. Knaus has it from various localities in eastern and central Kansas, where he finds it on sandy or clayey roads, sometimes as late as October. My personal acquaintance with the species, in life, is limited. I took it in June on a sandy lot in Denver, in company with the next species.

*C. formosa* Say. The red western type form is sometimes quite abundant on dry, open, sandy spots, among short grass and weeds, not in the immediate vicinity of water. It also frequents sandy roads in company with *scutellaris*. Wary and difficult of capture, though so conspicuous. Flight strong, often sustained. I have met with it at Cañon City, Colorado, in May, and at Denver in June and July. Mr. Oslar takes it at many localities in Colorado, about the foot-hills and

prairies. He gets it from April to June, and again, in smaller numbers, in the fall. The brown eastern form, *generosa* Dej., is rather abundant at Iowa City and Independence, Iowa, on sandy roads or flats, associating with *C. lecontei*, but much more wary and difficult of capture. At Chicopee, Massachusetts, Mr. Knab finds it abundantly in bare sandy places in April, May, June and October. *C. venusta* Lec., catalogued as a variety, is now claimed by Mr. H. C. Fall as a good species. I found it at Denver, flying with *formosa*, which it greatly exceeded in numbers. At Bismarck, North Dakota, it was rather common early in September, along sandy roads through the Missouri bottom.

*C. latesignata* Lec. I found it abundant on Coronado Beach at San Diego, California, in August. It flew on the white sand above the immediate reach of the tide. Dr. Blaisdell took it also in April and May, often in company with *hirticollis*, *gabbi* and *hæmorragica*, on beaches, or sometimes on alkaline flats near sloughs. Mr. Fall says it occurs throughout the whole year but most commonly in mid-summer. The variety *tenuicincta* Schaupp, was found by Dr. Blaisdell at San Diego under the same conditions as the type.

*C. fulgida* Say. I found this species at Albuquerque, New Mexico, in September, on a flat sandy spot a mile from the river and overgrown with short, scattered grass clumps and a few weeds. Near Lincoln, Nebraska, they were once common in the great alkaline flat locally known as the "salt-basin," where I saw them flying early in May. They are less agile than many of the tigers. Dr. Williston records it as "abundant in western Kansas and southern Wyoming, frequenting upper banks contiguous but at some distance from water among buffalo grass. Quick of flight." The form *willistoni* Lec., is perhaps entitled to specific rank, at least so contend some of our Kansas brothers. A note kindly sent me by the discoverer, after whom it was named, reads thus: "The only place that I found it was at the end of Lake Como, Wyoming, an alkaline lake. They occur almost exclusively by themselves on the bare alkaline mud. They are very wild and difficult to capture, fairly abundant but isolated. My recollection is that no other species were found with them. My specimens were taken early in June, 1878. Not a single specimen was found elsewhere in the vicinity and it will not live among grass or vegetation like its nearly related forms."

*C. senilis* Horn. "About San Diego in damp places away from the coast" (Dunn). May to September. Mr Koebele found it in Death Valley and Mr. Fuchs has it from Inyo and Tuolumne Counties, California, June and July. Mr. Soltau says that he has captured great numbers in April near Salt Lake City on the low marshy grounds eight miles out towards the lake where the soil is quite sandy and covered with a thin coat of mud. It is probable that this note refers to what Captain Casey named *C. echo*.

*C. hyperborea* Lec. My only information regarding this insect comes from Professor F. L. Washburn of Eugene, Oregon. He took it commonly on the Oregon coast during the summer months. It flies along the beach, running over both wet and dry sand and is said to be very wary. The observations above recorded were made chiefly in Lincoln County during July and August. Dr. LeConte's original specimens came from Methy Portage in the Hudson's Bay Region. The form *limbata* Say, seems to be confined to the sand hill country of Nebraska. Professor Bruner found it in "blow-outs" where there was little or no vegetation. It is less active than many other sand-frequenting species not running nor flying so readily.

*C. ancocisconensis* Harris. For the following careful account of the habits of this species I am indebted to Mr. Ottomar Reinecke of Buffalo, New York:—"It is found only at one spot in the vicinity of Buffalo, a strip on the banks of Cazenovia Creek, eight miles from the city. The locality is about one mile in length and from an eighth to a half mile in width, on both sides of the creek. It is protected on the southwest by a bluff, sheltering it from the cold western winds. The soil is bottom lands, the deposits from near-by shale, sand and black mud. The *Cicindela* comes out of the ground during the first bright days of May and can be found until the middle of June. A second brood appears in August. On warm sunny days it is very wild, on cloudy days is sluggish and may then be found concealed under stones, twigs and boards. On such occasions I have dug it out of the banks of the creek. They are easily recognized during flight by an experienced collector on account of their large size and the bright metallic green of the underside. Several other species—*C. repanda*, *purpurea*, *sexguttata* and *punctulata* are more or less numerous in the same locality." Mr. Roland Hayward has taken it on rocky, wooded, mountainous country, alone or scattered along roads. His localities

are Underhill, Vermont, Mansfield (two specimens, August), "Glen" to Jackson, N. H., 1000 to 1500 feet, July 2. Dr. T. W. Harris, in his published Entomological Correspondence, speaks of its being found only near the water. In regard to this remark I have the following note from Mr. Edw. D. Harris:—"I remember well his discovery of *ancocisconensis* and am puzzled by this allusion to the water, for he took it first at North Conway in the White Mountains, and the only waters there are the small running streams of the woods and hills."

*C. vulgaris* Say. Seems to be most abundant along sandy strips, rather near water, though not necessarily close to the brink. At Denver, Colorado, I have often seen it in abundance along irrigating ditches which had overflowed on to the surrounding flats. At Iowa City I find it only in company with *lecontei*, while at Bayfield, Wisconsin, it was pretty generally distributed along the more open sandy roads. The variety called *obliquata* Kirby, in which the markings are very broad, I once met with in numbers during the month of June, on a flat sandy area at Coolidge, New Mexico, where the ground was partially overgrown with weeds. The Californian variety *vibex* Horn, is said by Mr. Fall to occur on ocean beaches, rarely he thinks. Mr. W. G. Wright has taken it in quantity near San Bernardino, California.

*C. repanda* Dej. A fluviatile species, most abundant on the banks and bars of rivers, streams and lakes. *C. oregonia* Lec., the western form, has the same habits as the type, and like it, seems to fly throughout the warm months of the year. Mr. Fall writes:—" *Oregonia* is common inland (in California) wherever there is moisture. I have taken it from March to October and it is probably at large throughout the year. Usually occurs in small swarms and is quite wary." *C. 12-guttata* Dej., another spotted form, has been said to be fond of very wet spots in marshes and the like. Dr. Blaisdell writes, regarding this variety, " Found alone or evenly scattered on dark sand and mud, in moist roads or on the banks of ponds, lakes and streams in San Diego and Calaveras Counties." The remaining form, *guttifera* Lec., has been taken near Phoenix, Arizona, by Dr. H. G. Griffith, who writes that it is to be seen in small numbers, unmixed with any other species, on wet sandy places along banks of rivers (Rio Verde, April 4 to 12). It is very shy and hard to capture. A few have been taken at electric lights in Phoenix during the month of June. Dr. Blaisdell tells me that it occurs during March and April near the Col-

orado River in eastern San Diego County on dark sand or ordinary soil by ponds and rivers. It is scattered and moderately shy.

*C. pusilla* Say. Apparently very rare. Schaupp notes its occurrence on moist mud in the Platte and other river valleys. *C. terricola* Say, was taken by the expedition from the California Academy of Science at San Pedro Martir and Sierra el Chinche, Baja California, in September and October.

*C. hirticollis* Say. Has much the same habits as *repanda* but is less commonly found in the interior. On the Atlantic beaches it is common. It is also to be had in less profusion along the shores of the great lakes and about the banks of smaller bodies of water, lakes or rivers. At Iowa City I took a few in August on a sand bar in the Iowa River. In California it has been taken by Mr. Fall along the Colorado River during July, and on Long Beach in August. Dr. Blaisdell took it at San Diego and in San Francisco County in April, flying in company with *latesignata* and *gabbi*. He noticed it chiefly on dark muddy shores along ocean and bay beaches or on the near-by flats. White sand was less productive.

*C. cinctipennis* Lec. It is said to occur "on muddy plains near rivers." I took a lot of the green form on the muddy flats bordering the Little Colorado River at Winslow, Arizona, in July. But the brown form seems to have different habits, since I got it in abundance along a sandy road running through a grove near Buena Vista, Colorado, in July. It is only moderately shy. Mr. Roland Hayward also found this brown form on the Placerville road, Horsefly Peak Divide, San Miguel County, Colorado, July 13. It occurred in swarms but not intermixed with other species. "From memory only," he writes, "I should say the soil was sandy, the country mountainous and rather thinly wooded or grassy. The beetles occurred along the road and near springs." The western variety, *imperfecta* Lec., is abundant locally at various points in Idaho, Oregon and Washington. I once came across it in numbers, early in June, along the banks of a creek near The Dalles, Oregon.

*C. lunalonga* Schaupp. The type is from Sierra County, California. So I am told by Mr. Chas. Fuchs who has the specimen in his collection. It was taken in July.

*C. rectilatera* Chaud. Abundant on river bars and sandy banks in southern Texas. I have taken great numbers at Columbus and Hous-

ton and noticed it swarming about road pools between Alice and Brownsville, June and July. It is quite easily captured. I have very seldom seen any tiger beetle in such great swarms as this.

*C. tenuisignata* Lec. I have found it commonly on muddy banks of pools during July, in the vicinity of the Colorado River at The Needles, California. It was also taken rarely at Columbus, Texas, in company with *rectilatera* and *sperata*.

*C. punctulata* Fabr. Chiefly taken on dry ground. I find it most abundant in roads through loamy soil where the color harmonizes with the surroundings. Still it often occurs on dry sand, in the same localities frequented by *generosa* and *lecontei*, while in Colorado it is abundant on city lots in Denver during the month of July. It is said by Schaupp to be common "in the streets of some of our large cities." *C. micans* Fabr., the western type, runs closely into *punctulata*, both in color and habits. Often both forms occur together, running in the bright sunshine over bared spots (as at Colorado Springs) in pastures or along roadsides during June, July and August. Nearly dried beds of rain-pools seem to be favorite situations for *micans* in the arid regions. In Arizona and New Mexico I often saw it by the sides of the railroad tracks. Prof. Townsend took it at Las Cruces (June and July) and Zuni (July 29), New Mexico, on bare sand or soil, occasionally amongst weeds. It is quite shy and flies very readily. In Iowa I have found *punctulata* at electric lights.

*C. tortuosa* Dej. This species occurs on muddy banks or flats, especially if saline, and along the sea shore. It is the commonest tiger on the sand beaches of the Bahama Islands, but seemed rarer at Key West. If the beaches are muddy, thus unfitting them for *dorsalis*, that species is often found to be replaced by *tortuosa*. Mr. Soltau found it on muddy creek-banks near Mobile, Alabama, and on the shores of Lake Pontchartrain, Louisiana. The Californian variety, *sigmoidea* Lec., has been seen in thousands by Mr. Fall on ocean beaches of the southern part of the state during August. Dr. Blaisdell took it commonly on dark sand and mud of bays, sometimes in company with *hæmorrhagica* and *hirticollis*, at San Diego.

*C. dorsalis* Fabr. Mr. Kemp finds it in great abundance "along the ocean front along the New Jersey coast. It inhabits the sand beaches from the tide line down to the edge of the water, whether high or low tide, during the heat of the day. It never gets far enough

away from the tide line to occur in company with *C. lepida*." I am not aware of the northern limit of range, but to the southward it is replaced in Florida by the form *media* Lec., which I have from Lake Worth, where it was taken by Dr. John Hamilton. The Texas beaches often swarm in July with the small variety *saulcyi* Guér. I have taken it in plenty on the open tracks of fine white sand at Galveston and in less numbers on Padre Island, off the mouth of the Rio Grande. It seems to avoid muddy stretches and is moderately difficult of capture.

*C. hamata* Brullé. "Occurs on the seashore of Louisiana, Texas and Florida" (Schaupp). Said to be common in June at Cedar Keys. Mr. Soltau has taken it on Deer Island, about two miles out in the Gulf, off Ocean Springs, Mississippi, hunting around close to the water's edge in August.

*C. marginata* Fabr. I took this on the beach at Key West, while Mr. Schwarz records it from seashore and lagoon beaches in April (rare) and June (common) at New Smyrna, Fort Capron and Cedar Keys, Florida. Mr. Kemp finds it on mud flats along the New Jersey coast, near Anglesea and Avalon, during July. He takes it in greatest abundance on hot days, on moist, bare patches of mud or black sand. Easy enough to capture with a light net. Dr. Gould, in his paper on the "Cicindelæ of Massachusetts," writes of specimens from his state, they "inhabit barren patches of earth on salt marshes where the tide occasionally flows; when disturbed they betake themselves to the high grass which they sometimes climb to escape the rising tide instead of flying before its approach."

*C. cuprascens* Lec. Rather common in Kansas. Professor Popenoe found it in Reno, Riley, Mitchell and Shawnee Counties, on river beaches and bars. Mr. Knaus took it at Fredonia, on salt marsh, and writes that Mr. S. C. Mason found the species in great abundance on a sand-bar at the mouth of a small stream opening into the Solomon River (Kansas). He easily took a number without the aid of a net. The locality is saline.

*C. puritana* Horn. This species is taken by Mr. F. Knab on the shores of the Connecticut River, along sandy beaches. He finds it near Chicopee and Springfield, Massachusetts, rather sparingly, from June 20 to July 25. By its curious attitude — the body being held higher in front than usual — it may be distinguished from *C. repanda*,

which inhabits like situations. It is quite shy and has been taken several times at electric lights.

*C. macra* Lec. In Kansas has been taken by Professor Popenoe, in the same localities and under the same conditions as *cuprascens*. In Iowa I have found it on river bars, especially when a thin coat of mud overlies the surface. It also appears occasionally on roads, July and August. Electric lights attract it very readily, in fact, I get most of my material at Iowa City by searching near the lights. The peculiar attitude noted under *puritana* is also shared by this insect.

*C. wapleri* Lec. Mr. Soltau took this species at Covington, Louisiana, "on the snow-white sand banks of a little stream which flows through a beautiful country covered with timber, mostly pine. Along the stream, however, there is plenty of other vegetation, oak, magnolia, sweet gum, holly and so on. I have taken the insects in May and June, never earlier nor later. All occurred in two spots only, though I traveled up and down the stream for a long distance. The beetles would dart around, more in the shade towards the sloping bank than close to the water's edge. They are less shy than some of the tigers."

*C. blanda* Dej. Said to occur on shores of rivers in Georgia and North Carolina.

*C. sperata* Lec. This beetle frequents river banks in the southwest. I took it in July at Columbus, Texas, on sand bars in the Colorado River. At Albuquerque, New Mexico, it came in numbers to electric lights during July. At Luna, a small station on the Atlantic and Pacific R. R., a few miles west of Albuquerque, I found it quite abundant on the shores of a little pond. The green, reddish cupreous and brownish forms were all swarming together. Mr. Roland Hayward took it at Aztec, Animas Valley, New Mexico, in July. Both the ordinary form and a greenish variety occurred on the muddy shores of a tributary to the Animas River. In California, Mr. Fall has found it rather plentifully along the sandy or muddy flats of the Colorado River in June and July. It was not very difficult of capture.

*C. gabbii* Horn. Dr. Blaisdell found it in August at San Diego, California, in August, on alkaline flats about sloughs near the bay, frequenting bare areas between patches of beach-berry and *Salicornia*. Often occurred with *latesignata* and *hirticollis*. Moderately shy. Mr. Fall says it is rare on Long Beach, while Mr. Dunn reports it from mud flats at Wilmington, California. Mr. Fall further remarks that so

far as his experience goes, all the tigers of southern California are found in damp situations, none occurring along roads nor in dry fields.

*C. hirtilabris* Lec. Mr. Schwarz collected it in Florida where it occurs on sandy soil in pine woods or on sandy paths through meadows. June.

*C. gratiosa* Guér. Taken by Mr. Soltau, running over sand in the hills covered with scrub oak, at Spring Hill, a residence portion of Mobile, Alabama.

*C. lepida* Dej. Very widely distributed, but local and usually not abundant. Mr. Kemp takes it at Avalon and Piermont, New Jersey, on white sand hills along the coast, just beyond the tide line. He finds it mostly on hot sunny days in July, quite wary and difficult to see on account of its color so closely resembling that of the sand. Professor Popenoe takes it sing'y in dry, sandy river bottoms and fields, among grass and weeds, in Shawnee and Riley Counties, Kansas, during June and July. In Nebraska Professor Bruner found it restricted to the bare sand of "blow-outs" in the sand-hill country. At Iowa City it is occasionally found on a curious sand-flat a short distance north of town. It is readily attracted to lights. I have found it at street lamps in Iowa City and Albuquerque, New Mexico. Professor Snow has a lot collected under like conditions in Douglas County, Kansas. The most interesting experience of this sort, however, is that related to me by Professor W. H. Harshbarger, regarding his collecting the species in Topeka, Kansas. He writes: "I have taken about one hundred, mostly males, around the low arc lights in front of stores. I invariably found them at some distance from the lamp close to the wall. They seemed to shun the bright light and never got out on to the walk as do some others. The most fruitful place was just around a corner from a light, where they were in semi-darkness. Most of the captures were made in July and August, a few in June. They seemed sluggish and easy to take. I never caught one in daylight though I looked for them along the river and have collected over the entire region here."

*C. lemniscata* Lec. This is an active little species which I found rather commonly running and flying in hot sunshine by the sides of the Southern Pacific R. R. tracks near Tucson, Arizona, in August. It frequented nearly bare spots which had been more or less wetted by recent rains, but far from any permanent water supply. I also found

it in similar situations at Luna, New Mexico, sometimes hiding under tufts of grass. Dr. H. G. Griffith took it at light in Phoenix from June to October, but never saw it by daylight. I also met with it in quantities at the street lights of Tucson. Professor Townsend took it September 25 on bare white sand on the lower Mesa, far from water, in the vicinity of Las Cruces, New Mexico.

*C. circumicta* Laf. Mr. Knaus finds this species on salt marsh, in June, July and less commonly in August, in the vicinity of Fredonia, Kansas. It is commonest near the water's edge, where the bare saline ground is moist and warm, and in sheltered offshoots where the sun shines hottest. Professor Popenoe has found it in abundance on salty or alkaline clay lands on the prairies of Mitchell County, Kansas, in July. My own experience with it is limited, but I got a few at Point Isabel, Texas, near the mouth of the Rio Grande; it occurred on the open beach where the great salt marshes come down to the sea, and is a strong, rapid flyer. The form *prætextata* Lec., took once, at electric light in Albuquerque, New Mexico.

*C. togata* Laf. This is also a salt marsh species and is known from the "basin" at Lincoln, Nebraska, as well as from the alkaline or saline marshes of Kansas and Texas. In the last named state, I found it at various points between Brownsville and Point Isabel, always on saline flats, rarely close to the beach. It is a rather wary insect and a very rapid runner. Professor Popenoe takes it in company with *circumicta*, but more rarely.

*C. pamphila* Lec. I met this in great numbers along the beach at Point Isabel, Texas, during June and the early part of July. It is not so partial to clean, white sand as is *saulcyi*, apparently preferring more dirty ground, where the great salt marshes open on to the sea. Not difficult of capture, though by no means slow.

*G. severa* Laf. Also found at Point Isabel in July, in company with *pamphila*. But it is a most extremely wary species, of very strong, swift flight, and was met with rarely. It presents a magnificent appearance when alive and flies in the hottest sunshine.

*C. striga* Lec. Unknown to me. Taken by Hubbard and Schwarz at night, when it was attracted by camp-fires at Lake Harney and Enterprise, Florida, in May. As this species is said to be extremely closely allied to *severa*, it is strange if they are really so diverse in habits as the note would seem to indicate. It is quite likely that the

attraction by light was equivalent to that which is now well known in many truly diurnal tiger beetles, for example. *levida*, *sperata* and *lemniscata*, and that it might have been found flying by daylight if the proper spot had been hit upon.

*C. hæmorrhagica* Lec. Dr. F. Blaisdell has found it at San Diego, California, in April and May, on dark sand or clay soils along the bay beach and on alkaline flats, running about between patches of maritime vegetation. It is shy. I took it once at Provo City, Utah, running along sandy roads in May. The form *pacifica* Schaupp, I took on a mud flat at Barstow, California, in August, while Dr. Blaisdell finds it at Del Mar in the same state. He writes: "It occurs on sand, white or dark, the latter preferably, both on the ocean beach and at Poway, fourteen miles from the coast, on the course of a creek emptying into the ocean. It is found alone, scattered and shy. The soil on the beach is bare, that along the creek grassy and weedy. At night the beetles repair to crevices in the cliffs which border the shore of the ocean. Schaupp, in his synopsis, states that *pacifica* 'has no markings at all,' which is a mistake, as I have taken a great many specimens with markings similar to *hæmorrhagica*, but of the characteristic color of *pacifica*." He further remarks concerning those California tiger beetles on which he furnished notes, "All are abundant in their season except *hæmorrhagica*, which has become quite rare about San Diego Bay beaches where they were common before the advances of civilization."

*C. rufiventris* Dej. This species is said to be abundant on the hills in Kentucky, opposite Cincinnati. The variety *cumatilis* Lec., was found by Mr. Soltau on muddy places in the woods by Oak Grove, Mobile, Alabama, in company with the type. The form *16-punctata* Klug, I found in abundance on the shores of the Rio Grande at Albuquerque, New Mexico, flying about muddy flats. A single specimen was also taken by the margin of a small pond at Luna, twenty-two miles farther west. A variety of this species, apparently not described, has been taken in the Cañon of the Colorado River. I propose for it the name *arizone*, with the following characteristics: Form of *16-punctata*, reddish bronze above, with greenish reflections which are more pronounced on the head. Elytra with complete humeral lunule, median band not or very slightly extended along the margin, obliquely bent, not much narrowed at any part. A small post-median lateral dot is present. The apical lunule is complete, but there is a tendency,

quite well defined, to a separation of the anterior portion in the form of a dot. Under side of body bronzed with green and golden reflections, trochanters and abdomen reddish, legs cuprous. Length, 11 mm. Compared with a male *16. punctata* from Luna, New Mexico, *arizonea* has the head rather more distinctly rugose, the elytral sculpture a trifle coarser, while the sutural spine and the serration of the elytral apices are much better marked. The labrum is formed exactly as in *16. punctata*. Both pairs of palpi are pale at base in my specimens, which are males. Mr. Roland Hayward sent me specimens labelled "Grand Cañon of the Colorado" and I have since received the same thing collected by Professor Townsend, who writes: "I collected the species in the Grand Cañon during the first two weeks of July, 1892. It occurred on sandy places or along paths by a stream going down a side cañon, from 2500 feet above, down to the level of the Colorado River. Or from 5000 feet above sea (at Hance's stone cabin, 2500 feet below the rim and about two or two and a half miles down the trail from river) quite to the bottom of the cañon, which is here 2500 feet above the sea. The insect is not especially wary."

*C. hentzii* Dej. Mr. Roland Hayward tells me that it is found on rocky, more or less wooded hillsides, usually sunning on bare rocks. It occurs alone and scattered. He cites several localities in eastern Massachusetts, i.e., Milton, Medford, Gloucester, Brookline, West Roxbury. It flies from June to August. Dr. A. A. Gould, in his "Cicindelæ of Massachusetts," writes: "This very interesting species was discovered by Dr. T. W. Harris on the summit of Blue Hill in Milton. It does not prefer the sand and the plain, but its habit is to bask on the broad flat masses of granite which rise above the soil, retiring to the patches of moss and lichen which vegetate in the crevices. When flying in the sunshine its crimson and nearly transparent abdomen appears like a drop of blood suspended to its tail."

*C. marginipennis* Dej. "On the banks of the Susquehanna below the bridge at Harrisburg; banks of the Delaware near Callicoon," (Schaupp). Mr. Nathan Reist informs me that he takes it on sandy soil or more or less on cobblestones on river bars at Marietta, Pennsylvania, from the middle of June to the first of September. It occurs in swarms but is difficult of capture on account of a peculiar habit. They are very watchful and stand on the round stones. As soon as the net falls over them, instead of flying up they run out from beneath, the inequalities produced by the pebbles keeping the net from lying flat.

*C. abdominalis* Fabr. Said to occur on sandy paths in pine forests. Dr. Le Conte says on sand blackened by forest fires. Mr. Chas. Liebeck writes that during the last week in June ten or twelve specimens were seen between Hammonton and Da Costa, New Jersey. It frequents wagon roads through woods and does not confine itself to any one locality, those that were seen being scattered in ones and twos along the entire distance. Mr. Schaupp wrote that his *scabrosa* occurred with the type in Florida.

## NOTES ON GRASSES OF NEBRASKA, SOUTH DAKOTA AND WYOMING.

BY L. H. PAMMEL.

In two former papers the writer\* has discussed the grasses of Colorado and Nebraska. In this paper I shall enumerate the grasses collected during the season of 1897. The grasses of Wyoming have been discussed in a general way by Tweedy,\*\* F. Lamson-Scribner, and Frank Tweedy,\*\*\* Parry,\*! Nelson,\*!! Forwood,\*\*! and Greene.\*\*\*!

The forage conditions of the state have been discussed more especially by Williams† for Northern and Northeastern Wyoming, and the Red Desert Region of Southern Wyoming by Nelson.‡

The writer desires to acknowledge the assistance rendered him by Prof. F. Lamson-Scribner who kindly looked over the grasses collected on the trip.

\* Notes on the Grasses and Forage Plants of Iowa, Nebraska and Colorado. Bull. U. S. Dept. of Agri. Div. of Agro. Washington. 9:47. f. 1-12. 1897.

† L. H. Pammel and F. Lamson-Scribner. Some Notes on Grasses Collected in 1895 Between Jefferson, Iowa, and Denver, Colorado. Proc. of Agrl. Sci., 17:94-104, 1896 (Contr. Bot. Dept. Iowa Agrl. College. 3).

\*\* Flora of the Yellowstone National Park. Washington. 69-74. 1886.

\*\*\* Grasses of Yellowstone National Park. Bot Gazette. 11:169-178.

\*! Botanical Observations in Western Wyoming. Am. Nat., 8:9, 102, 175, 211. 1874.

\*!! First Rept. on the Flora of Wyoming. Bull. Wyoming Agrl. Exp. Sta., Laramie. 28:189-197. 1896.

\*\*! Expedition Through the Big Horn Mountains, Yellowstone Park, etc. Rept. of Mr H. Forwood. Washington. 27-39. 1882.

\*\*\*! Rambles of a Botanist in Wyoming Territory. Am. Nat. 8:31-34, 208-211.

† A Report Upon the Grasses and Forage Plants and Forage Conditions of the Eastern Rocky Mountain Region. Bull. U. S. Dept. of Agrl. Div. Agro. Washington. 12:78. f. 1-30. 1898.

‡ The Red Desert of Wyoming and Its Forage Resources. Bull. U. S. Dept. of Agrl. Div. of Agro. Washington. 13:72. pl. 1-5, f. 1-24. 1898.

## ITINERARY.

It will not be necessary to refer at length to the stops made at Alma, Oxford, or Hastings, all in Nebraska. Grand Island, Nebraska, was reached on the 23rd of June and the day was spent collecting, chiefly along the Platte River. New Castle, Wyoming, was reached on the 24th. At Sheridan, Wyoming, on the 26th, I was joined by Mr. E. M. Stanton. The remainder of the day was spent collecting in and about Sheridan. On the 27th, in company with Mr. Stanton and J. V. Crone, we started with camping outfit for Dome Lake in the Big Horn Mountains. The night of the 27th we camped on Dome Lake Road near a spring at an altitude of 5,500 feet. The road proved excellent as it is much traveled by those who are interested in the summer resort at Dome Lake. We reached Rapid Creek Park by 12 M. on the 28th at an altitude of 7,500 feet, and Dome Lake in the evening of the same day, altitude of 9,200 feet. We camped in the vicinity of Dome Lake for two days collecting in the vicinity of the lake and mountain. On June 30th we made a detour to the west branch of the Big Goose on the road to Shoshone Basin. This proved a most excellent place for collecting. We returned to Sheridan on July 3rd. On July 4th and 5th some time was spent collecting in the vicinity of Sheridan. On July 7th the writer spent a day collecting at Broken Bow, Nebraska. A few grasses were also obtained at Ravenna, the same state, where the train stopped for half an hour.

## TOPOGRAPHICAL FEATURES AND ECOLOGICAL NOTES.

The flood plains of the Platte River in and about Grand Island are admirably adapted for grazing purposes. The wide flood plain of the river makes it evident that the stream once carried large bodies of water from the adjacent prairies and the mountains beyond the plains. It now carries large bodies from the spring freshets. The fact that such water comes from the adjacent hills indicates that it must bring with it large quantities of loose and very excellent soil. The soil is of a sandy loamy nature and along the river edges of the flood plain, plants have easy access to moisture. The adjacent hills are cut by small valleys. Through Box Butte and Dawes counties the country is more broken and the western pine, *Pinus ponderosa* var. *scopulorum*, makes its appearance. This ruggedness is much more pronounced in

Fall River County, South Dakota. In the vicinity of Edgemont the elevation is 3,415 feet and higher hills 3,550. Many of the hills are nearly denuded except an occasional *Pinus ponderosa* var. *scopulorum*. On the dry sterile hills *Stipa comata* and *Koeleria cristata* are abundant. The small, narrow valleys contain an abundance of *Agropyron spicatum*. Edgemont marks the southeastern portion of the Black Hills range. Between Edgemont and New Castle, on the western slope of the range, there is a continuous rise. At the latter point the elevation is 4,019 feet. The coniferous woods contain mostly the *Pinus ponderosa* var. *scopulorum*. The green of the leaves is in strong contrast with the soil which is covered by minute particles of a black shale. The hills are extremely rugged and are traversed by small and narrow cañons. In the coniferous woods such grasses as *Koeleria cristata*, *Poa Buckleyana* *Oryzopsis micrantha*, are common. The *Agropyron spicatum* and *Bouteloua oligostachya* are common on the plains, affording excellent pasturage. In the cañons *Stipa viridula*, *Elymus condensatus* are common. These are associated with two species of *Symporicarpos*: the *S. occidentalis* and *S. racemosus*.

Such hydrophytic plants as *Panicularia aquatica* and *P. nervata*, occur along the streams. One notes further, such eastern and northern plants as *Cystopteris fragilis*, *Galium aparine* and *Rubus strigosus* in the woods.

From New Castle to Gillette there is a gradual incline. The elevation at Gillette is 4,520 feet, one of the highest points along the division of the road. The country is extremely broken, consisting of low ranges intersected by narrow cañons. In the distance from Moorcroft the famous Devil's Tower may be seen. The *Pinus ponderosa* var. *scopulorum*, becomes less numerous. As we left Jerome, and at Moorcroft, it seemed to disappear except an occasional pine on some hill. The hills seemed sterile and afforded but a scant growth. The *Artemisia tridentata* on the higher points and *A. longifolia* in the valleys are conspicuous plants of the region. The *Agropyron spicatum* and *Bouteloua oligostachya* were common about Gillette. Another grass which we had seen quite common at Edgemont and New Castle appeared to thrive on the dry plateau, namely, *Hordeum caespitosum*. From Gillette to Sheridan the country retained much the same character, the same red clay deposits with long ranges of low hills intersected by cañons. These hills are much subject to washing at some seasons and are nearly devoid of vegetation. Between

Lariat and Arvada the Powder River is crossed. The water is of a reddish color from the suspended matter taken from the surrounding country. The valley is fairly fertile and some most productive fields of grass occur. Along Clear Creek there is excellent grazing. The river has its source in the Big Horn Range. In the irrigated fields of this region there were splendid fields of alfalfa and timothy. *Elymus condensatus* grew abundantly in the flood plains. One could also see, here and there, a purple spiraea—*S. Douglasii*. Sheridan has an elevation of 3,712 feet and is situated in the flood plain of the Big and Little Goose Rivers. These streams, fed by snow from Clouds and other peaks in the Big Horn Range, carry a good flow of water during the entire year. Many fine farms under irrigation are found in these valleys. In close proximity to the streams such shrubs as *Shepherdia argentea*, *Fraxinus viridis*, *Negundo aceroides*, abound. On these open flats we noted *Cnicus undulatus* var. *canescens*, *Lepachys columnaris* in abundance. In the moister, natural meadows, *Beckmannia erucaeformis*, *Bromus breviaristatus*, *B. Pumellianus*, *Agrostis alba*, and *Phleum pratense* occur. The adjacent hills are extremely dry, but here *Agropyron spicatum*, *Koeleria cristata*, and *Delphinium azureum* occur.

Farther up the stream the timber was more abundant. We noted the common occurrence of *Populus angustifolia*, *Prunus Americana*, *Crataegus Douglasii*. In the rich shaded woods *Dodecatheon Meadia*, *Allium brevistylum*, *Brunella vulgaris* and *Monarda fistulosa* are found. The latter was not absent in and about Sheridan but at an altitude of 4,500 feet the flowers were deeply colored. Of the grasses, mention may be made of such hydrophytic species as *Phalaris arundinacea*, *Phragmites vulgaris*, *Panicularia nervata*, and *Beckmannia erucaeformis*. The *Elymus condensatus*, large and vigorous specimens along the roadsides.

In the foot-hills there was an appreciable change in the character of the vegetation. The country is marked by extremely precipitous bluffs. The archæan ledges in many cases are several hundred feet high. The foot-hills along the Dome Lake road are marked by coniferous and deciduous forests. The soil is a rich, tenacious red loam with outcrops of limestone. The lower belt of timber is made up of *Pinus ponderosa* var. *scopulorum* and *Pseudotsuga Douglasii* which was abundant in some places. *Thermopsis montana*, *Lupinus argophyllus*, *Campanula rotundifolia* grow in the open and denuded places. Here too *Agropyron spicatum* and *Koeleria cristata* grow in quantities. The

wooded areas are marked by a fine growth of *Stipa Columbiana*, *Festuca Kingii*, and *Melica subulata*. The highest points of these hills are covered with *Pinus flexilis*, *P. Murrayana*, and on the limestone outcrops *Juniperus virginiana*. One of the most striking features of the region are the large parks—the paradise of the ranchmen. *Festuca nevadensis*, *Elymus glaucus*, *Stipa Columbiana* and *S. Nelsoni* grow abundantly. One of the most striking features of the first park on the Dome Lake road are the Geraniums. Acres and acres are covered with *Geranium Fremontii* and *Polygonum bistorta*. Much of the region beyond as far as Rapid Creek is covered with *Pinus Murrayana*. Large areas here have never been burned and consist of magnificent forests of this species.

In the Rapid Creek region a fine series of parks prevail, with narrow cañons leading into the adjacent mountains. The most abundant grasses of the park region are *Festuca rubra*, *Koeleria cristata*, *Agropyron spicatum* var. *molle*. In moister places the *A. pseudo-repens* is found. The narrow cañons are mostly boggy in their character. Here the Engelmann Spruce (*Picea Engelmanni*) is accompanied by such plants as *Moneses uniflora*, *Pyrola rotundifolia*, and *Heuchera pentandra*. Such grasses as *Poa leptocoma*, *P. Wheeleri*, *P. arctica*, species that have become habituated to the cold conditions prevailing in these bogs, occur. Aside from these cold bogs there are numerous wet marshes near the stream which are devoid of trees and shrubs. Here may be found *Savastana odorata*, *Dodecatheon Meadia*, *Allium schoenoprasum*, *Thalictrum sparsiflorum*, *Myosotis sylvatica* var. *alpestris*, and along the edge of the stream *Mertensia sibirica*. The Dome Lake region, with an altitude of from 8,800 to 9,500, is chiefly characterized by the numerous moraines. Here are to be found the characteristic rounded boulders of all sizes. One is agreeably surprised when the moraines are ascended to find a lake or a pond on the other side, nearly all without outlets. These lakes vary considerably in size; some are less than an acre in extent, others of considerable size as Dome Lake, which is partially artificial. These lakes occur without reference to the drainage of the streams in their proximity. In one instance a lake less than an acre in extent occurred near the very edge of the Goose River, one hundred and fifty feet above. The plant atoll may here be studied in all phases of its development. One of the most picturesque scenes in the entire region is the deep cut made through the archaean rocks and moraine, where a branch of the Goose

finds its way to the West Branch. The moraines often have their peculiar plants. The soil is extremely dry on the surface and we find here such grasses as *Poa nemoralis*, *P. Buckleyana*, *Festuca ovina*, *Sedum stenopetalum*, *Antennaria dioica* and *Draba streptocarpa*. Close to the moraine are large flats where there is considerable moisture. Here *Savastana odorata*, *Viola palustris*, *Mertensia sibirica*, *Phleum alpinum*, *Deschampsia caespitosa*, and *Potentilla fruticosa*, *Kalmia glauca* var. *microphylla* grow in great quantities. On the shaded side of these moraines considerable snow still remained on the first of July; here we found *Kalmia glauca* var. *microphylla*, and *Viola palustris*.

The predominating tree at this elevation is *Pinus Murrayana*. The Engelmann Spruce occurs only in the cañons, and here too we again find *Poa Wheeleri*, and *Phleum alpinum* is one of the most common grasses in such places. Elk Mountain, with an approximate elevation of 11,000 feet, contains the usual alpine plants. The timber line begins at about 10,500 feet. Just below it the Engelmann Spruce forms a belt of timber. Of the grasses we may enumerate: *Poa Suksdorffii*, *P. Fendleriana* in dry open woods, elevation 10,000 feet, *P. rupestris*, *P. Wheeleri*. Associated with these plants we note *Douglasia montana*, *Silene acaulis*, *Primula Parryi*, *Dryas octopetala*, *Trollius laxus*; and *Mertensia alpina*. It is interesting to observe that some western representatives reach the eastern borders of the Rocky Mountains.

#### VARIATION AS TO ALTITUDINAL DISTRIBUTION.

Altitude is an important factor in the distribution of plants. It has long been recognized that animals and plants are not universally distributed over the earth's surface but follow certain lines, as C. Hart Merriam\* says: "Which lines indicate a change in temperature uncongenial to the species. \* \* \* The temperature selected as probably fixing the limit of northward distribution is the sum of effective heat for the entire season of growth and reproduction, for it has been proved experimentally and long recognized by phenologists that many species of plants require a definite sum total of heat in order to successfully perform the several vital functions of leafing, blossoming and fruiting, and that such plants cannot mature their seed until a particular sum of heat is attained." Merriam holds that the geographic distribution of animals and plants may be expressed as follows:

\* The Geological Distribution of Animals and Plants in North America. Year Book, U. S. Dept. of Agriculture, 1894:211.

"In northward distribution terrestrial animals and plants are restricted by the sum of the positive temperatures for the entire season of growth and reproduction.

"In southward distribution they are restricted by the mean temperature of a brief period during the hottest part of the year."

These principles cover the fundamental facts.

Some species have adapted themselves to a wider range than others. This is shown very nicely in such species as *Festuca ovina*, which occurs at an altitude varying from 4,500 to 10,000 feet. We note, however, that soil has an important bearing on its distribution. *Agropyron spicatum* is perfectly at home on the plains of Nebraska and adjacent foot-hills of the Big Horn Mountains, but at an altitude of 7,500 feet it is not so common. Here it has nearly reached its altitudinal limit of distribution. Its occurrence in and about Rapid Creek Park on dry slopes is not peculiar since the sunny sides of the parks receive an intense heat during the day. The soil is dry and this accounts for its full development. The *Poa Buckleyana* seemingly has a considerable range of altitude. Its occurrence at New Castle at an altitude of 4,019 feet is not strange, for many of the plants of this interesting region are northern. The nights are cool and the timber has greatly modified the excessive heat of the adjacent plains. At Dome Lake, 9,200 feet, this species occurs on the moraines. The soil, as I have said elsewhere, is of a gravelly nature, the surface being very dry. The *Agropyron tenerum* is not only common at Hastings, Nebraska, altitude 1,943, Grand Island, 1,872, and Broken Bow, 2,488, but along the irrigation ditches and streams at an altitude somewhat less than 5,000 feet. The *A. pseudo-repens* has a wider distribution. It is not uncommon in the prairie states, Iowa, Colorado and Nebraska. It occurs not only at Broken Bow at 2,480 feet, but in the grassy parks at 5,500, and 8,500 feet of the Big Horn Range. But moisture is the factor which determines its distribution at a lower altitude. A more interesting case of the influence of moisture on the distribution of species is to be found in some of the species of *Poa* collected on the trip, namely, *Poa arctica* and *P. Wheeleri*. The altitude of *P. arctica* is 7,500 feet, not, however, in connection with *Savastana odorata*, which is abundant in the open, wet, grassy meadows, but with *Poa Wheeleri* and *P. leptocoma* in the cold spagnaceous swamps and cañons where the Engelmann Spruce occurs. In Northern Colorado the writer\*

\* L. H. Pammel, Ic. Bull. Div. of Agros. 7:41.

found the same species at the edge of a snow bank, altitude 10,000 feet, and along a deep cañon in which the Engelmann Spruce occurred and mosses characteristic of those swamps, at an altitude of 9,000 feet. Here the water comes from the melting snow of the mountains, but the water held in these mossy swamps is ice cold. So, too, the water in the Engelmann Spruce swamp in Rapid Creek Park, though not coming from snow banks in the mountains, was cold. This *Poa* is a sub-arctic plant which has found a congenial home in these sub-arctic cañons that radiate from the mountains. The *Poa Wheeleri* may be placed in the same category. The *P. Suksdorffii* has apparently a narrower altitudinal distribution. It is quite important to take into consideration altitudinal distribution as well as the nature of the soil. In comparing notes for the season of 1896 and 1897 it is interesting to observe that some of the species occur at nearly the same altitude. A few cases are here appended, including Fort Collins, Colorado, and Sheridan, Wyoming.

SPECIES.	MEDICINE BOW RANGE, AND FOOT-HILLS, N. COLO.	BIG HORN RANGE, AND FOOT-HILLS, WYOMING.
<i>Beckmannia erucaeformis</i> ....	4,980—	3,715— 4,000
<i>Bouteloua oligostachya</i> .....	21,980— 7,800	3,715— 4,000
<i>Calamagrostis purpurascens</i> .....	10,000—11,000	10,000—
<i>Deschampsia caespitosa</i> .....	7,775—11,000	7,500— 9,500
<i>Festuca Kingii</i> .....	8,700— 9,500	5,500— 7,800
<i>Koeleria cristata</i> .....	5,000— 7,775	3,730— 7,500
<i>Phleum alpinum</i> .....	8,300—10,000	7,500— 9,500
<i>Phleum pratense</i> .....	4,950—10,500	3,715— 6,600
<i>Poa arctica</i> .....	9,500—10,000	7,500—
<i>Poa Buckleyana</i> .....	9,100—	7,500— 9,200
<i>Poa Fendleriana</i> .....	8,500—10,500	10,000—
<i>Poa nemoralis</i> .....	7,500— 9,500	5,500—10,000
<i>Poa rupestris</i> .....	9,000—10,000	9,500—10,500
<i>Poa Wheeleri</i> .....	9,100—	
<i>Savastana odorata</i> .....	8,500—	7,500— 9,200
<i>Stipa viridula</i> .....	4,978— 5,000	3,715—
<i>Trisetum subspicatum</i> .....	10,500—11,200	6,500— 9,200

This table seems to indicate that the same species occur at a much lower altitude in Wyoming than in Northern Colorado, a fact borne out by other plants found in this region. Some exceptions occur as *Koeleria cristata* and *Bouteloua oligostachya*. The plain surrounding Sheridan is much lower than Fort Collins. The descent towards the Medicine Bow Range is much more gradual than in the Big Horn. From the base of the Big Horn foot-hills in Sheridan County, in the

vicinity of Big Horn, a steep incline occurs. At the edge of this timbered area some sub-arctic plants occur and a very large percentage of these species are boreal. As an instance, *Pinus flexilis* may be cited. In Northern Colorado this forms a distinct zone between 10,000 to 11,000 feet, but in Sheridan County it occurs at about 6,000 feet.

#### WEEDY GRASSES OF THIS REGION.

There are few weedy species. The most common weedy grass is Squirrel-tail grass. Two species occur; the weedy species of Nebraska is *Hordeum jubatum* which, as elsewhere, especially east of the Missouri, comes up in great quantities. In South Dakota, in the vicinity of Edgemont, and in Wyoming, about New Castle, Gillette, and Sheridan, the prevailing species is *H. caespitosum*, although *H. jubatum* is not absent. It is evidently a species well adapted to dry situations but grows more luxuriantly along irrigation ditches. The ever-common Foxtails (*Chaetochloa glauca* and *C. viridis*) are abundant in Nebraska. The *Hordeum pusillum* is an injurious intruder in Nebraska.

#### LIST OF GRASSES COLLECTED.

##### PANICEÆ.\*

*Panicum atlanticum* Nash. Open prairies. No. 168. Hastings, altitude 1,943.

*P. capillare* Linn. Broken Bow, altitude 2,478. Everywhere in fields. No. 168.

*P. Crus-galli* Linn. Hastings, altitude 1,943. Low grounds, common. No. 22.

*P. Scribnerianum* Nash. Alma, altitude 1,950. Open prairies, common. No. 23.

*Chaetochloa viridis* Scribner. Broken Bow, altitude 2,478. A common weed everywhere in fields. No. 74. At Grand Island, everywhere a common weed in fields, along railroads and in streets. No. 18. It was commonly observed at other points, Alma, Aurora, and Ravenna.

*Cenchrus tribuloides* Linn. Broken Bow, altitude 2,450. Sandy soil, common in streets and sandy flood plains of streams. No. 151. Commonly, also, observed at Grand Island.

\* The numbers following the locality refer to distribution of plants of Nebraska, South Dakota, and Wyoming. Distributed by the Iowa State College of Agriculture and Mechanic Arts.

## PHALARIDEÆ.

*Phalaris arundinacea* Linn. Grand Island, altitude 1,872. Common in alluvial flood plains of Platte River. A valuable early grass. No. 25. Big Horn, Sheridan County. Common also in low grounds, Goose Creek, No. 24.

*Savastana odorata* Scribner. Dome Lake, Sheridan County, altitude 9,200. Abundant on flats in vicinity of moraines, forming in many instances a fine turf. No. 83. Rapid Creek, Sheridan County, altitude 7,500. Low marshy ground. No. 82.

## AGROSTIDEÆ.

*Aristida fasciculata* Torr. Alma, altitude 1,950. Common on prairies, dry hills and flats. No. 32. Grand Island, altitude 1,872. Dry sandy soil and hills. No. 185. Broken Bow, altitude 2,480. Dry hills, common. No. 33. New Castle, altitude 4,019. Common on dry hills. No. 31.

*Stipa comata* Trin. and Rupr. Edgemont, altitude 3,415. Common on dry hills. No. 1. New Castle, altitude 4,019. Mostly small plants, dry sterile hills. No. 2. Sheridan, altitude 3,729. Dry hills, common. No. 160.

*S. Columbiana* Macoun. Along the edges of the timber, and in the Parks, Sheridan County. Above Big Horn on Dome Lake Road, altitude 5,500 to 7,000. A large and beautiful grass. No. 193.

*S. Nelsoni* Scribner. Sheridan County above Big Horn, Dome Lake Road and in Geranium Park, altitude 7,500. A handsome species. No. 194.

*S. viridula* Trin. Alma, altitude 1,750. Common, prairies and flood plains of Republican River. No. 16. New Castle, altitude 4,019. Common along roadsides and in cañons. No. 3. Sheridan Road, altitude 3,712. In flood plains of Little and Big Goose Rivers, common. No. 4.

*Eriocoma cuspidata* Nutt. New Castle, altitude 4,019. Dry sterile soils. No. 66.

*Oryzopsis asperifolia* Michx. West branch of the Big Goose River, and on the road to Sheridan, altitude 8,500. In open woods. No. 72.

*O. exigua* Thurber. Dome Lake, Sheridan County, altitude 9,500. No. 92a.

*O. micrantha* Thurber. New Castle, altitude 4,050. Dry woods. No. 147, No. 88.

*Phleum alpinum* Linn. The species grows in wet marshy places, forming a fine turf. No. 12. Sheridan County, Big Goose, altitude 8,500. In low, wet places. No. 10. On road to Shoshone Basin, No. 162.

*Phleum alpinum* var. *Scribnerianum* Pammel. Culms 5-6 dm. high, the lower leaves 10-25 cm. long; spikes 3-4 cm. long. Spikelets, including the awns of the empty glumes, nearly 6 mm. long. This variety differs from the species in its larger and more robust habit of growth. It forms compact masses and grows in rather dry red clay soil. Sheridan County, Wyoming, Geran-

ium Park, altitude 7,500. No. 6. L. H. Pammel, July 1, 1897. Named in honor of the distinguished agrostologist.

*Phleum pratense* Linn. Hastings, altitude 1,943. Meadows common near the pump-house. No. 13. Aurora, altitude 1,803, streets. No. 5. Broken Bow, altitude 2,748. Meadows near New Castle in cañons. No. 8, No. 9. Big Horn, Sheridan County, altitude 4,000. In irrigated fields a most excellent grass. No. 11. Sheridan County above Big Horn, altitude 6,600. Along Dome Lake Road, undoubtedly introduced by horses and travelers. No. 7.

*Alopecurus geniculatus* Linn. Sheridan, altitude 3,712. No. 197.

*Sporobolus cryptandrus* A. Gray. Grand Island, altitude 1,872. Prairies and along roadsides. Common in sandy soil. No. 12. Broken Bow, altitude 2,488. Sandy soil. No. 19. Ravenna, altitude 2,008. Common in sandy soil near station. No. 20.

*Agrostis alba* Linn. Grand Island, altitude 1,865. Common along Platte River, flood plains. No. 35. Hastings, altitude 1,943. Common near pump-house. No. 93. Sheridan, altitude 3,712. Common in flood plains of Big and Little Goose Rivers and in the vicinity of irrigation ditches. No. 34.

*Agrostis scabra* Willd. Hastings, altitude 1,943. Common on prairies. No. 37. Oxford, altitude 2,085. Common on prairies. No. 36. Sheridan, altitude 3,712. No. 209.

*Calamagrostis canadensis* L. var. Sheridan County, west branch Big Goose near the road to Shoshone Basin, altitude 8,500. Low grounds, forming a turf. No. 41.

*C. hyperborea* L. New Castle, altitude 4,019. In cañons. No. 40, No. 204.

*C. purpurascens* R. Br. Dome Lake, Sheridan County, altitude 10,000. No. 171.

*Calamovilfa longifolia* Scribner. Ravenna, altitude 2,008. Common in sandy soil. An excellent soil-binder. No. 65.

#### AVENEÆ.

*Deschampsia caespitosa* Beauv. Sheridan County, Rapid Creek Park, altitude 7,500. Common in moist meadows. No. 90. Sheridan County, Dome Lake, altitude 9,200. Moraines, common. No. 79. Dome Lake, altitude 9,200. Common in open timber. No. 91.

*D. caespitosa* Beauv., var. *pilosa* Beauv. Dome Lake, Sheridan County, altitude 9,500. Common. No. 100a.

*Trisetum subspicatum* Beauv. Sheridan County, above Big Horn, altitude 6,500. Dry sterile hills and in pine woods. No. 176. Rapid Creek Park, Sheridan County, altitude 7,000. Common in pine woods and dry hills. No. 179. Dome Lake, Sheridan County, altitude 9,200-10,000. In dry *Pinus Murrayana* woods, moraines. No. 180.

*T. subspicatum* Beauv., var. *molle* Gray. Sheridan County, and west branch of Big Goose on road towards Shoshone Basin. Common in *Pinus Murrayana* woods. No. 99.

## CHLORIDEÆ.

*Schedonnardus paniculatus* Trelease. Oxford, altitude 2,085. Common, dry prairies, No. 163; Alma, altitude 1,950, similar places. No. 15. Hastings, altitude 1,943. No. 16. Broken Bow, altitude 2,488. No. 14.

*Bouteloua oligostachya* Torr. Alma, altitude 1,950. Common. Blue Grama is one of the most valuable grasses found on the plains. No. 29. Sheridan, altitude 3,712. No. 207.

*Beckmannia erucaeformis* Host. Sheridan, altitude 3,712. Common, flood plains of Little and Big Goose Rivers, and along irrigation ditches. A valuable grass. No. 30.

*Bulbilis dactyloides* Raf. Broken Bow, altitude 2,475. Not uncommon on hills and flood plains of streams. No. 68a.

## FESTUCEÆ.

*Munroa squarrosa* Torr. New Castle, altitude 4,019. Common on plains. No. 172.

*Phragmites vulgaris* B. S. P. Sheridan and Big Horn, altitude 3,700-4,500. In low standing water.

*Eragrostis major* Host. Aurora, altitude 1,803. Introduced and common in streets. No. 152. This species also abounds at Hastings, Alma and Grand Island.

*Eatonia obtusata* A. Gray. Alma, altitude 1,950. Common, flood plains of the Republican River. No. 38. Grand Island, altitude 1,872. Abundant, flood plains of the Platte River. No. 48. No. 95. Broken Bow, altitude 2,488. No. 89. Oxford, altitude 2,085. No. 167. Hastings, altitude 1,943. No. 39. Sheridan, altitude 3,712. No. 195.

*E. Pennsylvanica* A. Gray. Sheridan, altitude 3,712. Flood plains of Little and Big Goose Rivers. No. 173, No. 196. Big Horn, Sheridan County. No. 212. Along irrigation ditches, altitude 4,500. No. 117.

*Koeleria cristata* Pers. Alma, altitude 1,950; dry prairies. No. 73. Oxford, altitude 2,085. Hastings, altitude 1,943. No. 80. Grand Island, altitude 1,872. Also found at higher places. Flood plains of Platte River. No. 110. Broken Bow, altitude 2,478. No. 109. Sheridan, altitude 3,732. A low grass on dry prairies. No. 75. Sheridan County. Along Dome Lake Road near spring, altitude 5,500. Dry hillsides. No. 184. New Castle, altitude 4,019. Dry hills, common. No. 111. Sheridan County, Rapid Creek Park, altitude 7,500; on dry hills. No. 81.

*Melica bulbosa* Geyer. Dome Lake Road, Sheridan County, near spring, altitude 5,500, rich woods. No. 158.

*M. spectabilis* Scribn. Sheridan County. In localities similar to the last species and growing with it. Altitude 6,500. No. 71.

*M. Pammellii* Scribn. n. sp. A slender, erect perennial, 6-10 dm. high from a bulbous base with scabrous sheaths, narrow, elongated, flat leaves

and loosely flowered, simple panicles 18-25 cm. long. Ligule hyaline, scarious, more or less erose, 3-3 mm. long; leaf-blade 10-30 cm. long, 5-10 mm. wide. Panicle-branches erect or ascending, flexuous, scabrous. Spikelets 3-6 flowered, lanceolate or narrowly oblong, 12-18 mm. long; empty glumes unequal, oblong, lanceolate, obtuse or subacute, the first 6 mm. long, 3-nerved below; the second 8 mm. long and 5-nerved, with broad hyaline margins, scabrous on the nerves. The first flowering 9-10 mm. long, 9-nerved, oblong, lanceolate, acuminate, broadly scarious margined above; apex variable, acute, subacute, or occasionally 2-toothed, scabrous on the back, specially on the nerves, with a few flexuous hairs near the margins towards the base. Palea much shorter than the glume, more or less arcuate, 9-7 mm. long, densely ciliate, fringed along the nerves, except towards the base, where they are smooth, and punctate scabrous between them.

Geranium Park, Wyoming, altitude 7,500. No. 159. L. H. Pammel, July 1, 1897. Named in honor of the collector.

This species is apparently intermediate between *Melica bromoides* and *M. subulata*. The flowering glumes are much broader, less narrowly acuminate, and in general larger than in *Melica subulata*. The inflorescence and general aspect of the panicle and spikelets resemble those of *Melica bromoides*, but the flowering glumes are longer, more acuminate pointed and the internodes of the rachilla are shorter, the lowest in *Melica pammellii* being about 2 mm. long. It is further distinguished by the presence of a few hairs near the margin of the flowering glumes.

*Distichlis spicata* Greene. Grand Island, altitude 1,872; alkaline flats, Platte River bottoms. No. 98. Broken Bow, altitude 2,478; alkaline flats. No. 77. New Castle, altitude 4,019. No. 76. Sheridan, altitude 3,732; alkaline flats of Big and Little Goose Rivers.

*Poa arctica* R. Br. Rapid Creek Park, Sheridan County, altitude 7,500, and in Engelmann Spruce swamp. A beautiful and delicate grass. No. 138.

*P. Buckleyana* Nash. Rapid Creek Park, Sheridan County, altitude 7,500. Open places in parks, not common. No. 118. New Castle, altitude 4,019. Similar situations. No. 133. Dome Lake, Sheridan County, altitude 9,200. Moraines, dry places. No. 134.

*P. compressa* L. Grand Island, altitude 1,872. Introduced in streets, and flood plains of Platte River. No. 115. Rapid Creek Park, Sheridan County, altitude 7,500. This large open park is frequently used as a camping ground. The species was undoubtedly introduced. No. 120.

*P. Fendleriana* Steud. Dome Lake, Sheridan County, altitude 10,000. Near timber line. In open spruce woods. No. 139.

*P. laevigata* Scribner. Sheridan, altitude 3,732. Flood plains of Big and Little Goose, along irrigation ditches. No. 119.

*P. leptocoma* Trin. Rapid Creek Park, Sheridan County, altitude 7,500. A delicate grass occurring in cold bogs where the Engelmann Spruce grows. No. 128.

*P. lucida* Vasey. Spring above Big Horn, Sheridan County. Dome Lake,

altitude 6,500. Open park, common. No. 156. New Castle, altitude 4,019. Near spring. No. 137.

*P. nemoralis* L. New Castle, altitude 4,019. In pine woods near streams and in cañons. No. 155. Rapid Creek Park, altitude 7,500. Common in open parks. No. 113. Dome Lake, Sheridan County, altitude 9,500. Open pine woods and moist places. No. 112. West branch of the Big Goose River and near the road to Shoshone Basin, altitude 8,500. Common in open pine woods. No. 68.

*P. nevadensis* Vasey. Sheridan County, Dome Lake Road. Geranium Park, altitude 7,500. This beautiful species produced an abundance of good forage and was common along the roadside. No. 132. Rapid Creek Park, Sheridan County, altitude 7,500. Common in open places. No. 230. New Castle, altitude 4,019; near spring. No. 131. In open woods and parks. A beautiful and productive grass growing in large quantities along the roadside.

*P. wyomingensis* Scribn. sp. nov.' A rather stout, erect, glabrous perennial 4-7 dm. high with flat leaves and narrow, densely-flowered panicles 10-20 cm. long. Sheaths striate, smooth, the lowermost loose and more or less scariosus; ligule hyaline acute 4-6 mm. long, leaves rather soft, 8-12 cm. long, 3-5 or 6 mm. wide, very smooth excepting at the rather abruptly pointed apex. Spikelets broadly lanceolate, acute, 5-7 flowered, 8-10 mm. long; empty glumes very acute, rather broadly lanceolate, strongly scabrous on the keels above and minutely scabrous all over, the 1st about 4 mm. long and 3-nerved, the 2nd broader than the first, 3-5-nerved and about 5 mm. long; flowering glumes ovate oblong, the first one usually 5-5 mm. long, usually erose at the obtuse apex, sometimes shortly mucronate by the prolongation of the midnerve, scabrous on the back with a somewhat crisp pubescence towards the base; the hairs extend on to the callus where they are about 0-5 mm. long. Palea shorter than the glume, strongly scabrous on the prominent keels.

Allied to *Poa nevadensis* but distinguished by its broader, less rigid, flat and glabrous leaves and larger flowering glumes, which are conspicuously pubescent towards the base. Also closely allied to *Poa Buckleyana* but the leaves are broader, less flaccid and smooth, not scabrous as in that species, the spikelets more numerously flowered (2-3-flowered in *P. Buckleyana*), the florets more distant and the flowering glumes are more distinctly pubescent near the base. Buckley describes the flowering glumes of *P. Buckleyana* as being naked at the base.

In clay soil above Big Horn, Sheridan County, Wyoming, altitude 6,000-7,800. No. 192. L. H. Pammel, July, 1897.

*P. pratensis* L. Hastings, altitude 1,943. Common in meadows near pump-house. No. 94, No. 116. Oxford, altitude 2,085. One of the finest lawns along the B. & M. R. R. in Nebraska occurs at Oxford, where this species is used. No. 181. Rapid Creek Park, Sheridan County, altitude 7,500; in parks. No. 126.

*P. rupestris* Vasey. Dome Lake, Sheridan County, altitude 10,500. Near the timber line, and at timber line in open places. No. 124.

*P. Suksdorffii* Vasey. Dome Lake, Sheridan County, altitude 10,500. At timber line it forms a fine turf. No. 139. Dome Lake, altitude 9,500. Moraines, occurs with *P. rupestris* Vasey. No. 125.

*P. Wheeleri* Vasey. Rapid Creek Park, altitude 7,600. In swamps with Engelmann Spruce. No. 122. Sheridan County, near spring above Big Horn, Dome Lake Road, altitude 5,500. No. 67. Dome Lake, Sheridan County, altitude 9,500. Moraines and flats. No. 114. Dome Lake, altitude 10,000. Just below timber line. No. 154. Sheridan County, west branch of Big Goose, road to Shoshone Basin, altitude 8,500. No. 121. This species appears to delight in cold, wet swamps.

*Panicularia aquatica* Kuntze. New Castle, altitude 4,520. In cañons and running water, shallow brooks. No. 146a. Sheridan, altitude 3,812. No. 200.

*P. nervata* Kuntze. New Castle, altitude 4,019. In cañons near running water and low grounds. No. 123. Sheridan County, near Big Horn, altitude 4,000. Irrigation ditches. No. 183, No. 199.

*Festuca brevifolia* R. Br. Sheridan County, Dome Lake, altitude 10,500. At timber line. This species is common and grows in small bunches. No. 188.

*F. elatior* L. var. *pratensis* A. Gray. Grand Island, altitude 1,872. Platte River bottoms; thoroughly naturalized. The only place where the writer has seen it so common in the west. No. 84.

*F. Jonesii* Vasey. Sheridan, altitude 6,500. In open parks and borders of spruce and pine timber. No. 191a.

*F. Kingii* Scribner. Rapid Creek Park, Sheridan County, altitude 7,500-7,800. In open parks. No. 187, 182. A large and beautiful grass in dry places, spring above Big Horn, Dome Lake Road, Sheridan County, altitude 5,500. No. 87.

*F. octoflora* Walt. Alma, altitude 1,950. Common on dry prairies. No. 70. Grand Island, altitude 1,872. No. 69. New Castle, altitude 4,019. Occurs in pine woods and open dry places. No. 85.

*F. ovina* L. This species occurs near the spring above Big Horn, Sheridan County, Dome Lake Road, altitude 5,500; where it grows in dry places forming bunches. No. 169. No. 190 from the same place is doubtfully referred to this species. No. 187 is a variety of this variable species found in the same place. No. 153 is from Rapid Creek Park; common in dry places, altitude 7,500.

*F. ovina* L. var. *ingrata* Hackel. Sheridan County, on Dome Lake Road near spring, altitude 5,500. Grows in bunches in dry places. No. 189.

*F. rubra* L. Rapid Creek Park, Sheridan County, altitude 7,500. This species is extremely common in open dry places where it forms bunches of considerable size. It is much more valuable than *F. ovina*. No. 191.

*Bromus breviaristatus* Buckl. Sheridan, altitude 3,732. Flood plains of Big and Little Goose Rivers, and along irrigation ditches. A valuable and one of the most common grasses with *Beckmannia erucaeformis*. No. 148. Sheridan County. Dome Lake Road, Geranium Park, altitude 7,500. In fertile soil of this park it is a most valuable grass. No. 51. Near spring edges of timber along the same road, altitude 5,500. No. 96.

*B. Pumellianus* Scribner. Sheridan, altitude 3,732. Also along irrigation ditches. A very valuable grass. No. 166.

*B. racemosus* L. Grand Island, altitude 1,872. Near ice houses in Platte River bottoms abundantly naturalized. Very valuable. No 52, 97.

#### HORDEÆ.

*Agropyron caninum* L. Dome Lake Road above Big Horn in Sheridan County, altitude 7,810; common in parks. No. 165. Sheridan, altitude 3,712. No. 206.

*A. dasystachum* Vasey var. *subvillosum* S. & S. New Castle, altitude 4,017. Common in pine woods. No. 141.

*A. divergens* var. *tenuispicum* S. & S. Sheridan County, Dome Lake Road, altitude 5,500. Borders of woods, and in open woods. No. 86. Rapid Creek Park, Sheridan County. No. 150.

*A. pseudo-repens* S. & S. Rapid Creek Park, altitude 7,500. In open grassy parks, common. No. 63, No. 170. Dome Lake Road, Sheridan County, altitude 5,500, in open grassy woods. No. 64. Sheridan County, west branch of the Big Goose on road to Shoshone Basin, altitude 8,500, in open woods. No. 53. Broken Bow, altitude 2,478. In grassy meadows near stream. No. 54. Sheridan, altitude 3,712. No. 203.

*A. Richardsoni* Schrad. Sheridan, altitude 3,712. No. 211.

*A. spicatum* S. & S. Alma, altitude 1,950, prairies, abundant. No. 56. Hastings, altitude 1,943. Aurora, altitude 1,803. No. 55. Broken Bow, altitude 2,478. No. 58. Edgemont, altitude 3,415. No. 57. New Castle, altitude 4,019. No. 146, No. 177. Sheridan County, Dome Lake Road, Geranium Park, altitude 7,500. Sheridan County, altitude 3,712. No. 288. This species is one of the most common grasses in these parks, where it makes a fine growth. No 43. This occurs everywhere in Nebraska, S. Dakota and Northern Wyoming. The statement made by rangers that it is common only to the ranges of Northern Wyoming and Montana is erroneous, as the grass is equally common in Colorado, extending southwest to Arizona where it is one of the most valuable of the range grasses.

*A. spicatum* S. & S. var. *molle* S. & S. Sheridan County, Rapid Creek Park, altitude, 7,500, dry open parks. No. 140. Sheridan, altitude, 3,712. No. 196.

*A. tenerum* Vasey. Hastings, altitude 1,943, near pump-house. No. 61. Grand Island, altitude 1,872, along Platte River. In these bottoms it is a very common species. No. 60. Broken Bow, altitude 2,478, near streams. No. 62. Ravenna, altitude 2,008. Along railroad, and in low grounds. No. 59. Sheridan, altitude 3,712. No. 203.

*A. violaceum* Vasey. Sheridan County, west branch of the Big Goose River on road to Shoshone Basin, altitude 8,500, in dry open woods. No. 142.

*Hordeum cæspitosum* Scribn. n. sp. An erect, cæspitose perennial, 3.5 dm. high with smooth culms and sheaths and terminal bearded spikes 4.7 cm. high. Ligule short, hardly 1 mm. long, very minutely fringed, broader than the flat, striate, scabrous, very acute leaves which are 5-15 cm. long and 3-5 cm. wide. Empty glumes subulate from the base, about 20 mm. long including the awns; the central floret nearly sessile, lanceolate fusiform, about 6 mm. long exclusive of the awn, which is 12 mm. in length, the lateral spikelets raised on short pedicels, as are the rudimentary florets of the lateral spikelets.

This species is chiefly distinguished from *H. pratense* Huds. by its longer and more slender awns and rather shorter flowering glumes. The glumes in *H. cæspitosum* are less scabrous and the shorter awns much more divergent. From *H. jubatum* this species is at once distinguished by its very much shorter awns and different habit of growth, and slender spikes.

Edgemont, South Dakota. No. 143. Pammel, June 24, 1897; also Geranium Park, Wyoming. No. 157. L. H. Pammel, July, 1897. Common in the Rocky Mountain region.

*H. jubatum* L. Alma, altitude 1,950, a weed in fields. No. 107. Oxford, altitude 2,085. No. 103. Hastings, altitude 1,913. No. 198. Aurora, altitude 1,803. A common weed everywhere. No. 102. Broken Bow, altitude 2,478. No. 106. New Castle, altitude 4,019, common. No. 105. Sheridan, altitude 3,862. No. 103.

*H. pusillum* Nutt. Grand Island, altitude 1,872. Common in streets. No. 101.

*Secale cereale* L. Aurora, altitude 1,800. An escape along railroads. No. 17. Grand Island, altitude 1,872. Also a frequent escape in streets. No. 175.

*Elymus canadensis* L. Alma, altitude 1,959. Common in dry soils. No. 45. Hastings, altitude 1,950. No. 186. Sheridan, altitude 3,612. No. 168, 210.

*E. condensatus* Presl. New Castle, altitude 4,019. A large and beautiful grass growing along the borders of woods. No. 49. Sheridan, altitude 3,732. Flood plains of Little and Big Goose River. No. 174. Big Horn, Sheridan County, altitude 4,009. Along irrigation ditches and in meadows. No. 49.

*E. glaucus* Buckl. Sheridan County, Geranium Park, altitude 6,500-7,000, common in open parks. No. 46.

*E. robustus* S. & S. Broken Bow, prairies, altitude 2,478. Small form. No. 145.

*E. striatus* Willd. Alma, altitude 1,950. In woods and small cañons. No. 44.

*E. virginicus* L. Alma, altitude, 1,950. Low rich woods, along Republican River near the foot-hills. No. 47 is a glaucus form; No. 100, from the same place but in open woods and higher ground. Sheridan, altitude 3,712. No. 205.

*Sitanion elymoides* Raf. New Castle, altitude 4,019, common in dry soil. No. 50.

## FUNGI COLLECTED IN COLORADO, WYOMING, AND NEBRASKA IN 1895, 1896, AND 1897.

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H. HAROLD HUME.

INTRODUCTION BY L. H. PAMMEL.

IN 1895 a collecting trip was planned embracing the region about Pike's Peak, Clear Creek Cañon and some other points in Colorado. Additional stops were made at several places in Nebraska, and for the sake of convenience these plants are also listed here, although we have excellent accounts of the fungi of this state by Professor Bessey, his students, Webber, Pound, and others. Full lists of the Nebraska fungi may be found in the reports of the Experiment Station and the excellent contributions issued by the University of Nebraska.

In the year 1896 a trip was made through northern Colorado. The first stop was made at Ft. Morgan, which is near the Platte River. Most of the collecting here was done in the river bottom. From there I went to Greeley, where a few specimens were collected, and later some were gathered in and about Ft. Collins.

I desire in this connection to express my obligations to Professors Crandall and Gillette for the numerous favors shown on the entire trip. Professor Crandall's familiarity with the country and knowledge of Colorado plants was especially valuable to me.

As to the relative importance of the parasitic fungi of the plains, a few general observations may be made in this connection. In the foot-hills, especially those adjacent to the plains, there are comparatively few widespread fungus diseases of plants although there are some species which are extremely abundant in places, as, for instance, the *Uromyces Sophorae*, which is widely scattered on *Sophora*, its host plant. The abundance of some other species of fungi on the plains may also be noted. The *Acidium Psoralee* on *Psoralea* is widely spread and also the *Puccinia Malvastri*. These fungi undoubtedly influence very

materially the abundance of these host plants on the plains. The only way to account for the abundance of these at lower altitudes is that the mycelium is perennial in the tissues of the hosts.

In places where there are dews or where moisture is more abundant, as in the flood-plains of the Platte River, parasitic fungi, like *Puccinia Xanthii*, occur in close proximity to the water. Entire plants are covered by it. Moisture, especially in the form of dew, is a very important factor in the distribution of fungi. As an illustration, it is not uncommon to find rusted wheat plants in close proximity to the irrigation ditches while in other parts the disease is not so common. It is well known that in and around these irrigation ditches heavy dews cover the grass in the morning.

We might note the fact here that grain rusts are not abundant at any point in Colorado, at least not nearly so common as we find them in the Mississippi Valley, and this is undoubtedly due to the fact that the plants are supplied with water by irrigation.

Farther up in the foot-hills, especially in the narrow cañons, fungi are more numerous. Frequently thousands of plants are affected, as, for instance, we find the *Æcidium alenii* on *Shepherdia Canadensis*. Near the timber-line and in the swamps and bogs, fungi are more numerous. As an illustration, the *Phragmidium Fragariastri* is found on nearly every plant of *Potentilla gracilis* in places.

Of the fungi on woody plants mention may be made of the *Peridermum cerebrum* on the Lodge-pole Pine. Although this fungus is widely distributed it is nowhere abundant. It usually occurs on the younger branches where it forms large swellings. The limb, in the course of a year or two, dies because the fungus cuts off the supply of nutrient material.

Among other interesting fungi of trees mention may be made of the Witches' Broom (*Exoascus nanus*) on *Betula occidentalis*. Hundreds of branches on a single tree were affected, giving it quite a strange appearance. This species has never been reported for this continent so far as I know and was first described by Johanson from specimens collected in Finland. Other *Exoasci* were not uncommon both at and around Pike's Peak and a large number of leaves of the Rocky Mountain Oak (*Quercus Gunnisoni*) in North Chyenne Cañon were affected. Several species of the genus *Prunus* were quite commonly affected along the Manitou trail.

The species here enumerated were in part identified by the writer; but the whole collection was worked over by H. H. Hume and the credit of naming the species belongs to him. I desire to express my thanks to Dr. W. G. Farlow, who has so kindly examined several of the *Uredineæ* and some of the *Exoasci*, and to J. B. Ellis for the identification of a few species.

#### AGARICACEÆ.

*Lenzites bicolor* F. On old logs, Larimer County, Col., (198).

#### POLYPORACÆ.

*Fomes carneus* Nees. On old logs, Fort Collins, Col., (258).

#### THELEPHORACEÆ.

*Exobasidium Vaccinii* (Tuck.) Woron. On leaves of *Vaccinium* sp., Little Beaver, Larimer County, Col., (130).

*Exobasidium* sp. On leaves of *Arctostaphylos* sp., Fort Collins, Col., (135). Too immature to identify.

#### NIDULARIACEÆ.

*Cyathus striatus* (Huds.) Hoff. On ground, above Big Horn, Sheridan County, Wyo., (260).

#### UREDINEÆ.

*Uromyces Euphorbiæ* Cooke & Peck. On foliage of *Euphorbia Preslii*, Crete, Neb., (5); *Euphorbia marginata*, Golden, Col., (10); Hastings, Neb., (64); Lincoln, Neb., (155); *Euphorbia glyptosperma*, Lincoln, Neb., (79); *Euphorbia obtusata*, Lincoln, Neb., (80). This caused the plants to have the usual attenuated appearance.

*Uromyces scutellatus* (Schrank) Lev. On foliage of *Euphorbia dictyosperma*, Sheridan, Wyo., (32).

*Uromyces Sophoræ* Peck. On foliage and stems of *Sophora sericea*, Fort Collins, Col., (30); McCook, Neb., (15). This host is common in some places and the fungus occurs locally.

*Uromyces Trifolii* (Hedw.) Lev. On leaves of *Glycyrrhiza lepidota*, Fort Collins, Col., (39); Sheridan, Col., (57); Greely, Col., (61),

(62.) The host plant is quite common in many places and usually the whole plant is affected by the fungus.

*Uromyces Zygadeni* Peck. On leaves of *Zygadenus elegans*, Sheridan, Wyo., (137).

*Melampsora farinosa* (Pers.) Schroet. On catkin of *Salix* sp., Manitou trail, Col., (31); on leaves of *Salix* sp., Beaver Creek, Col., (78). The occurrence of this fungus on the leaves was very common; only one catkin was found affected.

*Puccinia Anemones-virginianae* Schwein. On leaves of *Anemone multifida*, Stove Prairie Hill, Col. (142). This species was not uncommon on this anemone.

*Puccinia Caricis* (Schum.) Rebent. *Æcidium* on foliage of *Urtica gracilis* Fort Collins, Col., (8); *Carex* sp., Fort Collins, Col., (65). The *Æcidium* stage was extremely abundant on *Urtica* along the banks of streams and in timber—in fact, wherever the host was found.

*Puccinia congregata* Ell. and Hark. On leaves of *Saxifraga rivularis*, Beaver Creek, Col., (76).

*Puccinia curtipes* Howe. On leaves of *Heuchera bracteata*, Colorado Springs, Col., (21); on *Saxifraga* sp., Beaver Creek, Col., (73).

*Puccinia Distichlydis* E. & E. On leaves of *Distichlis maritima*, McCook, Neb., (18). In rather moist places this species was not uncommon.

*Puccinia Epilobii* DC. *Æcidium* on leaves of *Epilobium* sp., West Branch Big Goose, Wyo., (83). Abundant in a small area affecting a very large number of plants.

*Puccinia Gayophytii* Pk. On leaves of *Gayophytum racemosum*, Fort Collins, Col., (37); Beaver Creek, Col., (54). Very plentiful on plants under ledges of rock.

*Puccinia Geranii-silvatici* Karst. On leaves of *Geranium* sp., Big Horn Mountains, Wyo., (70). Although this Geranium was abundant the fungus was rare, only a few affected leaves being found.

*Puccinia graminis* Pers. On leaves of *Poa* sp., Larimer County, Col., (87).

*Puccinai Helianthi* Schw. On foliage of *Helianthus annuus*, Crete, Neb., (2); McCook, Neb., (4); Lincoln, Neb., (66). This species was abundant throughout Nebraska.

*Puccinia heucherae* (Schw.) Diet. On leaves of *Mitella pentandra*,

Little Beaver, Col., (55). *Saxifraga punctata*, Little Beaver, Col., (36). Not common.

*Puccinia irregularis* Ellis & Tracy. *Aecidium* stage on foliage of *Solidago* sp., head of Happy Hollow, Larimer County, Col., (81).

*Puccinia Menthae* Pers. *Aecidium* stage on leaves and stems of *Monarda fistulosa*, Long Gulch, Larimer County, Col., (46). Abundant in a few spots.

*Puccinia Pimpinellae* (Strauss) Link. On leaves of *Osmorrhiza longistylis*, Dome Lake, Wyo., (84).

*Puccinia rubigo-vera* (DC.) Wint. On leaves of *Triticum vulgare*, Crete, Neb., (145).

*Puccinia Stipa* Arth. On leaves of *Stipa* sp., Fort Collins, Col., (49).

*Puccinia Violæ* (Schum.) DC. *Aecidium* stage on leaves of *Viola Canadensis*, Big Horn, Sheridan County, Wyo., (58).

*Puccinia Xanthii* Schw. On leaves of *Xanthium Canadense*, Fort Morgan, Col., (25). Abundant only in Platte River bottoms, near the water.

*Puccinia Crandallii* Pammel & Hume n. sp. III. Sori variable, usually rather broad, long, black to brownish, tardily ruptured; spores smooth, sub-ovate or clavate, apex somewhat truncated, rounded or pointed; episore thickened at the apex,  $36-51 \times 18-29 \mu$ ; pedicel slightly colored, stout, longer than the spore. Differs from *P. graminis* in the much stouter pedicel and usually wider spores. On leaves and sheathes of *Festuca Kingii*, Larimer County, Col., (69).

*Puccinia uniformis* Pammel & Hume n. sp. II & III. Sori amphiginous, small, orbicular, surrounded by the ruptured epidermis, sometimes confluent.

II. Uredospores sub-globose, light brown, episore smooth, thin,  $12-15 \mu$ .

III. Teleutospores light brown, elliptical to sub-globose, obtusely rounded at the ends, slightly constricted at the septum, episore smooth, thin, not thickened at the apex,  $19-22 \times 12-15 \mu$ ; pedicel hyaline, fragile, shorter than the spore. On leaves of *Rumex paucifolius*, Dome Lake, Wyo., (86).

*Gymnosporangium clavariiforme* (Jacq.) Rees. *Aecidium* on fruit of *Amelanchier alnifolia* Nutt., Dome Lake, Wyo., (38). Abundant at high altitudes.

*Phragmidium Fragariastri* (DC.) Schroet. On leaves and stems of *Potentilla gracilis* var. *fastigiata*, Dome Lake, Wyo., (89); Beaver Creek, Col., (72). This host was abundant at the timber line, and in places nearly all the plants were affected.

*Phragmidium Rubi* (Pers.) Wint. On leaves of *Rubus deliciosus*. Fort Collins, Col., (92).

*Phragmidium subcorticium* (Schrank) Wint. On leaves of *Rosa* sp., Long Gulch, Larimer County, Col., (44); N. Cheyenne Cañon, (67); Fort Collins, Col., (68); Beaver Creek, Col., (77). Abundant in some places.

*Chrysomyxa Pirolæ* (DC.) Rostr. On leaves of *Pirola elliptica*, Beaver Creek, Larimer County, Col., (55). Common.

*Thecopspora Vacciniorum* (Link) Karst. On leaves of *Vaccinium* sp., Beaver Creek, Larimer County, Col., (150).

*Calyptospora Gæppertiana* J. Kühn. On twigs of *Vaccinium* sp., Beaver Creek, Larimer County, Col., (150).

*Ecidium abundans* Pk. On foliage of *Symporicarpos racemosus*, Fort Collins, Col., (7); above Big Horn, Wyo., (33); La Porte, (43). This *Symporicarpos* is abundant throughout the eastern slopes of the Rocky Mountains and one is almost certain to find the *Ecidium* on most of the plants.

*Ecidium Allenii* Clinton. On foliage of *Shepherdia Canadensis*, Larimer County, Col., (11), (34), (53). *Shepherdia argentea*, Sheridan, Wyo., (13), (90). The *æcidium* on *S. Canadensis* was quite common in higher altitudes; on *S. argentea* only a few specimens were found.

*Ecidium aquilegia* Pers. On leaves and petioles of *Aquilegia caerulea*, Beaver Creek, Col., (51). Abundant under a rocky ledge above the timber line.

*Ecidium clematidis* DC. On foliage and stems of *Clematis ligusticifolia*, Golden, Col., (6); Fort Collins, Col., (27), (40); Greeley, Col., (29); La Porte, Col., (63). The host grows abundantly in moist woods at lower altitudes. The fungus is very common, involving stems, petioles, and leaves, twisting and distorting the plant.

*Ecidium compositarum* Mart., var. *Helianthi* Burrill. On leaves of *Helianthus annuus*, Fort Morgan, Col., (26); *Helianthus grosse-serratus*,? Fort Collins, Col., (41). Not abundant at Fort Morgan, but abundant in moist woods near Fort Collins.

*Æcidium compositarum* Mart. On leaves of *Rudbeckia laciniata*, Beaver Creek, Col., (45); *Erigeron* sp., Beaver Creek, Col., (75); *Arnica* sp., Rapid Creek Park, Wyo., (82).

*Æcidium compositarum* Mart., var. *Lactuæ* Burrill. On leaves of *Lactuca pulchella*, Fort Collins, Col., (47). It was found abundantly in a few spots. The *æcidium* cups sometimes occur on the upper surface of the leaf in narrow longitudinal lines.

*Æcidium Ellisii* Tracy & Gall. On leaves of *Chenopodium album*, Fort Morgan, Col., (146). Rare.

*Æcidium Euphorbiæ* Gmel. On foliage of *Euphorbia Preslii*, Crete, Neb., (3); *Euphorbia marginata* Pursh., Golden, Col., (20). Locally common.

*Æcidium Grossularie* Schum. On leaves of *Ribes* sp., Beaver Creek, Col., (74). Abundant in a few localities.

*Æcidium Petalostemonis* Kell. & Carl. On *Petalostemon* sp., above Big Horn, Wyo., (71).

*Æcidium Pentastemonis* Schw. On leaves of *Penstemon* sp., N. Cheyenne Cañon, Col., (23); Golden, Col., (24). Though evidently widely distributed it was not found in abundance in either locality.

*Æcidium Phaceliae* Pk. On leaves of *Phacelia circinata*, Fort Collins, Col., (14).

*Æcidium Psoraleæ* Pk. On foliage of *Psoralea tenuiflora*, Colorado Springs, Col., (1); Fort Morgan, Col., (56). Widely distributed, affecting the entire plant.

*Æcidium Ranunculacearum* DC. On foliage of *Ranunculus Cymbalaria*, Fort Collins, Col., (9); on leaves of *Anemone* sp., Fort Collins, Col., (48); on leaves, flowers and stems of *Delphinium azureum*, Larimer County, Col., (16). The fungus was not found in any great quantity on any of the hosts. That on *Delphinium* was not typical, the cups being larger and much lighter in color than in the type.

*Æcidium Sommerfeltii* Johnson. On foliage of *Thalictrum Fendlerii*, N. Cheyenne Cañon, Col., (12); Manitou Trail, Col., (19); Fort Collins, Col., (38), (50); *Thalictrum sparsiflorum* Turcz, Rapid Creek Park, Wyo., (52), (88). Widely distributed and in places very abundant.

*Æcidium*. On leaves of unknown species of *Umbelliferae*, above Big Horn, Wyo., (59).

*Roestelia (spermagonia)*. On *Pyrus* sp., Colorado Springs, Col., (133).

*Peridermium cerebrum* Pk. On branches of *Pinus Murrayana*, (91). Found throughout the region but never abundant.

*Uredo ribicola* C. & E. On leaves of *Ribes aureum*, Beaver Creek, Col., (211).

*Uredo speciosa* Pk. On leaves of *Rubus deliciosus*, Golden, Col., (28); Fort Collins, Col., (93); N. Cheyenne Cañon, Col., (93); Manitou Trail, Col., (95).

#### USTILAGINÆ.

*Ustilago aristida* Pk. In ovaries of *Aristida purpurea*, McCook, Neb., (96). This was locally abundant.

*Ustilago Avenæ* (Pers.) Jens. In ovaries of *Avena sativa*, McCook, Neb., (97); Crete, Neb., (98).

*Ustilago Buchlöes* Ell. & Tracy. In ovaries of *Buchloe dactyloides*, Lincoln, Neb., (100). A few specimens were collected at Lincoln. It was not abundant.

*Ustilago Tritici* (Pers.) Jens. In ovaries of *Triticum vulgare*, Crete, Neb., (99).

*Eutyloma Physalides* (Kalchbr & Cooke) Wint. On leaves of *Physalis* sp., McCook, Neb., (—). This material was in excellent condition, spores germinating.

*Sphacelotheca hydropiperis* (Schum.) De Bary. In ovaries of *Polygonum bistorta*, Rapid Creek Park, Wyo., (101); *Polygonum viviporum*, Rapid Creek Park, Wyo., 102. Not abundant.

*Schizonella melanogramma* (DC.) Schroet. On leaves of *Carex* sp., above Big Horn, Wyo., (105).

*Sorosporium Ellisi* Wint. In ovaries of *Andropogon furcatus*, McCook, Neb., (103). For a considerable distance this fungus was common along the roadside.

#### PERONSPEROCEÆ.

*Cystopus Bliti* (Biv.) De Bary. On leaves of *Amarantus retroflexus*, Lincoln, Neb., (154).

*Cystopus Portulacæ* (DC.) Lev. On leaves of *Portulaca oleracea*, McCook, Neb., (120).

*Cystopus Tragopogonis* (Pers.) Schroet. On leaves of *Artemesia bienn.*

*nis.* Rist's Cañon, Col., (121). This is not usually common, but was found abundantly in one place on the above host.

*Plasmopara Geranii* (Pk.) Berl. On leaves of *Geranium* sp., Rapid Creek Park, Wyo., (156). This is also a somewhat rare fungus, and although this species of *geranium* is extremely abundant in the parks it was only after a diligent search that a few fungus-affected leaves were found.

*Plasmopara Kellermanii* (Ellis & Halstead) Swingle. On leaves of *Iva Xanthiifolia*, McCook, Neb., (122); Sheridan, Wyo., (123); Omaha, Neb., (140). Was quite abundant in a few localities.

*Peronospora Corydalis* De Bary. On foliage of *Argemone platyceras*, Golden, Col., (124). This fungus was less abundant at this point than at other localities. The fungus has also been collected in Western Iowa.

*Peronospora effusa* (Grev.) Rabenh. On leaves of *Chenopodium album*, Larimer County, Col., (139); Fort Collins, Col., (147); Crete, Neb., (134). This was not common at any of the points.

*Peronospora myosotidis* De Bary. On foliage of *Myosotis sylvatica* var. *alpestris*, Bosworth's Ranch, Larimer County, Col., (143). Quite a number of plants were found in a few places. The plants were weak and spindling.

#### PERISPORACEÆ.

*Podosphaera Oxyacanthæ* (DC.) De Bary. On leaves of *Prunus Virginiana*, Manitou Trail, Col., (111); N. Cheyenne Cañon, Col., (112). This was not abundant either at N. Cheyenne Cañon or along the Manitou Trail.

*Sperotheca castagnei* Lev. On leaves and stems of *Gilia* sp., above Big Horn, Sheridan County, Wyo., (107). This was extremely common on plants in damp places along the roadside.

*Microsphaera Symphoricarpi* Howe. On leaves of *Symporicarpos occidentalis*. (110).

*Erysiphe graminis* DC. On leaves of *Poa flava*, above Big Horn, Wyo., (109); *Poa Wolfii*, Golden, Col., (108). This was very abundant at Big Horn. Generally this fungus is not found fruiting, but these specimens showed well-developed perithecia. At Golden it was extremely abundant on grass growing in damp Douglas Spruce woods—in fact, there was scarcely a plant that was not affected.

## SPHÆRIACEÆ.

*Sphærella Fragariae* (Tul.) Sacc. On leaves of *Fragaria vesca*, Larimer County, Col., (125) (207); above Big Horn, Wyo., (205).

*Leptosphaeria eustomella* Sacc. On dead culms of *Festuca Kingii*, Sheridan County, Wyo., 136.

*Leptosphaeria culmifraga* Fr. On dead culms of *Festuca Kingii*, Sheridan County, Wyo., (136a).

*Pleospora herbarum* (Pers.) Rabh. On old stalks of *Lithospermum* sp., Sheridan County, Wyo., (259.)

## DOTHIDEACEÆ.

*Phyllachora Aristidæ* (Schw.) Sacc. On leaves of *Distichlis maritima*, Fort Collins, Col., (126).

*Phyllachora Trifolii* (Pers.) Tuck. On leaves of *Trifolium hybridum*, Broken Bow, Neb., (132).

*Plowrightia morbosa* (Schw.) Sacc. On leaves of *Prunus Americana*, Alma, Neb., (106).

## STICTACEÆ.

*Psuedopeziza medicaginis* (Lib.) Sacc. On leaves of *Medicago sativa*, Fort Morgan, Col., (131).

## GYMNOASCACEÆ.

*Taphrina cærulescens* (Det. M.) Tul. On leaves of *Quercus undulata* var. *Gunnisoni*, N. Cheyenne Cañon, Col., (113). This species is quite common in and about N. Cañon in the vicinity of Colorado Springs, but nowhere else was the species found.

*Exoascus cerasi* (Tuck.) Sadeb. On foliage of *Prunus Virginiana*, Manitou Trail, Col., (114); N. Cheyenne Cañon, Col., (115); Stove Prairie Hill, Col., (116); Bosworth's Ranch, Col., (117). This was not particularly abundant except in a few places along the Manitou Trail. The leaves were somewhat puffed out, giving to them a striking appearance.

*Exoascus Institiæ* Sadb. On foliage of *Prunus Pennsylvanica*, N. Cheyenne Cañon, Col., (119). This was common just below the timber line along the Pike's Peak Railroad. The diseased leaves of the trees were easily detected by their blistered appearance.

*Exvascus nanus* (Johanson) Sacc. On leaves, twigs and branches of *Betula occidentalis*, Happy Hollow, Larimer County, Col., (118). One tree was found very much affected, a number of branches showing well-marked Witches' Brooms.

#### SPHÆROPSIDEÆ.

*Septoria acerina* Pk. On the leaves of *Acer glabrum*, Pike's Peak, Col., (128).

*Septoria expansa* Niessl. On leaves of *Geranium* sp., Beaver Creek, Col., (212).

*Septoria Jamesii* n. sp. Pammel & Hume. Spots small, yellow, orbicular, becoming confluent and at length involving the whole leaf which becomes uniformly straw-colored; perithecia scattered, black, sub-globose; sporules hyaline, straight, cylindrical,  $28-32 \times 2.5-3\mu$ . On leaves of *Stellaria Jamesii*, Golden, Col., (201).

*Septoria lepidiicola* Ell. & Mart. On leaves of *Lepidium apetalum*, Grand Island, Neb., (203).

*Septoria lupulina* Ellis & Kell. On leaves of *Humulus lupulus*, Lincoln, Neb., (153). Collected by F. R. Clements.

*Septoria Pentstemonis* Ell. & Kell. On leaves of *Pentstemon* sp., Beaver Creek, Col., (210).

*Septoria Siscyii* Pk. On leaves of *Echinocystis lobata*, Fort Collins, Col., (141).

*Septoria Ribis* Desm. On *Ribes aureum* Golden, Col., (204).

#### MUCEDNIACEÆ.

*Microstroma americanorum* Pammel & Hume, n. sp. Spots large, pale, later brown, circular, becoming irregular; conidiophores hyaline, fasciculate, hyphophyllus, upper part somewhat irregular,  $39-47.5 \times 3\mu$ ; conidia hyaline, ovate-oblong, usually two nucleated, episporic thin,  $9-11 \times 6-9\mu$ . On leaves of *Cnicus americanus*, Larimer County, Col., (209).

*Ramularia arnalis* Ell. & Ev. On foliage of *Arnica cordifolia*, Larimer County, Col., (130); *Arnica* sp., Larimer County, Col., (208).

*Ramularia Psoraleæ* Ell. & Ev. On leaves of *Psoralea argophylla*, McCook, Neb., (202).

*Ramularia rufo-maculans* Pk. On leaves of *Polygonum incarnatum*, Sheridan, Wyo., (206).

*Ramularia Urticæ* Ces. On the leaves of *Urtica gracilis*, Lincoln, Neb., (151).

*Cladosporium gramimum* Corda. On glumes of *Triticum vulgare*, Crete, Neb., (114).

*Cercospora clavata* (Ger.) Pk. On leaves of *Asclepias speciosa*, McCook, Neb., (127).

*Cercospora dubia* (Riess) Wint. On leaves of *Chenopodium hybridum*, Lincoln, Neb., (152).

*Cercospora Geranii* Kell. & Swin. On leaves of *Geranium Fremontii*, Manitou Trail, Col., (129).



## SYNOPSIS OF PROCEEDINGS

OF THE

## Davenport Academy of Natural Sciences.

1897-1898.

*January 7, 1897.—ANNUAL MEETING.*

President Edward S. Hammatt in the chair; a large number of members and visitors present.

Reports of the various officers were presented as follows:

### RECORDING SECRETARY'S REPORT.

During the year 1896 there have been twelve regular meetings, one trustees' meeting, and one annual meeting. The attendance upon the regular meetings averages eight.

Eight regular and five honorary members have been elected during the year. Two members have died: Professor Wachsmuth of Burlington and Mr. W. H. Holmes of Davenport.

Lectures have been delivered before the Academy by Professor J. A. Udden of Augustana College, Rock Island, on Kansas Mounds; by Professor F. J. Walz, Local Signal Service Observer, on Weather Forecasts; by Professor L. W. Andrews of Iowa City on X-Rays; by Doctor Edward Gudemann of Davenport on The Development of Chemistry; and by Mr. George R. Putnam of the U. S. Coast and Geodetic Survey on A Recent Trip to the West Coast of Greenland.

The present number of life and other members is 142.

EDWARD BORCHERDT, *Recording Secretary.*

### CORRESPONDING SECRETARY'S REPORT.

During the year 1896 the correspondence was as follows: Letters received, 111; letters and acknowledgements written, 209. There was no departure from the ordinary subjects that from year to year come before the Secretary.

W. H. BARRIS, *Corresponding Secretary.*

## LIBRARIAN'S REPORT.

The number of books and pamphlets received since the last annual statement is: foreign publications, 467; domestic, 935; total, 1,402. The number of books and pamphlets, bound and unbound, now in the library is 32,855. These accumulations come to us chiefly in exchange for our own Proceedings, which we are sending to scientific societies in all civilized countries, and indicates in a substantial way an appreciation of the efforts of this Academy which must be encouraging to every member.

Additional shelving has been provided and a rearrangement and better classification (made necessary by the growth of the library) has been undertaken and prosecuted as the limited time of your Librarian permitted. This work, to which several members have lent much aid, is well begun.

As heretofore, a crying need in this department is binding. The small appropriation for the purpose granted early in the year has not been used because, by reason of limited funds, more imperative wants of the Academy have with much difficulty been met.

The considerable effort which has been given to the beginning of a Library Index has plainly proven that it is practically impossible to accomplish this important work by voluntary labor. It therefore remains, doubtless, the most urgent business of the incoming administration to provide means and cause the work to be done by a competent person under the direction of my successor.

C. E. HARRISON, *Librarian.*

## CURATOR'S REPORT.

The year has brought to the Academy museum substantial and varied additions. The first donation of the year was received from Mrs. Dr. C. C. Parry. It was a large, carefully wrought blanket made by the Pino Indians, and had a market value of one hundred dollars. In February T. Richter & Sons presented a wonderfully well preserved skin of the white skunk, obtained through the agency of the Musquakie Indians located near Cedar Rapids. In their dealings with the Company for twenty years nothing of the kind has been met with. Its rarity was further vouched for by the Indians, who pronounced it the only specimen they had ever obtained. In March the Historical Department was favored through Mr. Augustus F. Mast with the copies of his appointment to the postmastership of Davenport for the years 1856 and 1860—the one signed by President Buchanan, the other by President Pierce—both under glass and substantially framed.

In March was received from Mr. Clarence B. Moore of Philadelphia the core of a conch shell from the shell beds of Florida, with an interesting letter as to its finding and probable use.

In May Mr. C. A. Ficke presented to the Academy an Egyptian mummy obtained from the Boulak Museum of Cairo. Of the genu-

ineness of this relic of antiquity there can be no reasonable doubt whether we consider the opportunity of the giver or the institution from which it came. Dating back to the 20th dynasty of the Pharaohs, it had its origin in an age that has contributed much to the archaeological wealth of the present century. A mummy very much like this has just been received by the Museum of Fine Arts in St. Louis. Prof. Ives, in charge, is most enthusiastic in its praise. This comes to us in as good condition as found in any museum. The mummy itself suggests the care and labor of the embalmer and throws light on the manners and customs of a people passed away. The ornamentation of the coffin is a work of highest art and the figures stand forth as clear cut and the colors as effective as though they were wrought but yesterday. The Academy is to be congratulated in the possession of such an addition to its art treasures.

In May, Mrs. M. L. D. Putnam presented a collection of shells from Florida, with echinoids and corals. The shells were submitted to Miss Sadie Foote, and on examination several were found to be new to the Academy and were carefully labelled. At the same time several large and small cestacian vertebrae and fine teeth from the South Carolina phosphate beds were received from Mr. George Putnam. A collection of Mexican relics was bought of Prof. Starr of the University of Chicago. This collection included twenty pieces of pottery from ancient Mexican graves. Among these are two two-eared jars, one three-eared jar, three pitchers, three corndishes, three tripod food dishes, three obsidian flakes, three spindle wheels, and two scraping knives. Collected in another section were six of the puzzling little heads to be found in San Juan de Tcotihuacan, remarkably human little carved stone faces. There was also an obsidian nucleus and six little pottery vessels from Chapala almost as puzzling as the faces.

In June, Captain Hall remembered us by sending one large grooved stone axe, with thirty or forty flint implements, among them one exquisitely formed, leaf-shaped, over a foot in length, and with a central breadth of two inches, made of a jasper-colored flint.

In July, the Academy received from Dr. Palmer a collection of one large and one small celt, one small axe, a discoidal stone with minerals and two geodes.

In September, Captain Hall sent us two axes, one quite small, and thirty flint implements and arrows, large and small, mostly perfect.

In November, the gift of a genuine Eskimo kayak came to us from Greenland, a present from Mr. George R. Putnam. This now occupies a conspicuous place in the Academy. It is a model of grace and beauty. The outfit is in keeping with the appearance of the craft and the objects sought to be accomplished by it. The most primitive workmanship characterizes every article used. Everything needed has its place. All the simple devices of the Greenland Eskimo may be seen attached to the kayak in some place, as though ready for use. Paddle and harpoon, spear and casting stick, bird spear and sealskin

bladder and screen to protect the sailor and deceive the seal. And to add to the interest of the visitor the donor has taken pains to label each article, and the part it is to take is clearly pointed out.

A noteworthy accession was made to the museum by a gift from Mrs. Dr. Parry, comprising nearly fifty different articles. They may be classed under the head of minerals, shells from the California sea-coast, handiwork of the western Indians in their money, basket work, shell work, textile fabrics and products of the farm, with archæological and ethnological specimens. It is needless to say they were uniformly well selected and carefully labelled with name and locality.

In the same month Mrs. Major McClelland presented two beautiful, exquisitely delicate corals gathered on the Bermuda Islands.

Through Mrs. Putnam, Mrs. Underhill of Buffalo, N. Y., has sent to us a series of silver pins, once the property of the Tuscarora Indians of Western New York. It is claimed the art of working them was lost two hundred years ago. They become more scarce every year. The Indians part with them only when compelled to do so through their needs. Each form has for them a mystical meaning. The Academy had nothing of the kind in its collection. Mrs. Underhill kindly proffered to increase the number already sent. This gift is in keeping with the ethnological character distinguishing those of the present year.

Captain Hall sent his third collection at the close of the year. It comprises one remarkably large grooved stone axe, one small axe, one celt, two hematite miniature stone axes, twenty-three flint implements and two small arrow points. Ray Willard of Rapids City contributing a fine celt to the collection.

It is a remarkable fact that of the sixteen donations received this year no less than eleven have been more or less connected with ethnology and archæology. Our own government has published through the Bureau of Ethnology fifteen large quarto volumes on the subject. Other governments have shown a like interest. Universities and Academies of Science have formed associations to advance the science. Magazines in this country are devoted exclusively to the study. Our foreign exchanges supply us with their papers on the subject. The world seems to be moving in that direction, gathering up from every source material to throw new light upon the history, habits, customs, languages, arts and sciences of nations that have long passed away or have been overlooked.

We are in line with the work being done, not so much through what we have done this year, but because of what has been done in former years. Egypt, Greenland, Mexico, Florida, California — the Mound-builder of yesterday — the Indians of the west, as well as the east, have contributed to the enrichment of our archæological collection — one of the most notable features of this Academy.

W. H. BARRIS, *Curator.*

## TREASURER'S REPORT FOR 1896.

## GENERAL FUND.

## RECEIPTS.

Balance on hand .....	\$ 41.24
Balance on hand, error, 1895 .....	17.21
From Dues .....	126.00
Initiation fees .....	95.00
Interest .....	84.00
Annual subscriptions .....	426.00
Donations .....	382.00
Door admissions .....	47.55
Newbold estate .....	109.00
	—
	\$1,328.00

## EXPENDITURES.

Paid Salary of Curator .....	\$525.74
Janitor .....	95.50
Lights .....	5.34
Fuel .....	37.93
Water .....	16.00
Repairs .....	57.25
Printing .....	7.20
Expenses of lecture .....	11.50
New furnace .....	215.00
Cleaning and arranging .....	26.60
Postage, express, etc .....	26.76
New cases .....	19.83
Cementing basement .....	100.00
	—
Amount on hand in bank .....	\$140.29
Amount on hand with Treasurer .....	43.96
	—
	\$1,328.00

FRANK NADLER, *Treasurer.*

## PUBLICATION FUND.

## RECEIPTS.

Balance on hand from 1895 .....	\$ 33.65
From interest from Putnam Fund .....	\$ 96.00
Interest from Putnam Fund .....	142.37
Sale of Proceedings .....	4.50
Interest Putnam Fund .....	118.75
Interest Putnam Fund .....	118.75
	—
	\$ 480.37
	—
	\$ 514.02

## EXPENDITURES.

Paid Edward Borcherdt, 5½ forms Vol. V., etc .....	\$ 96.00
Edward Borcherdt .....	12.25
Edward Borcherdt, Prof. Starr's paper, extras .....	16.00
Egbert, Fidlar & Chambers, binding Vol. V .....	50.00
Drawings for Vol. VI .....	85.33
Edward Borcherdt, account .....	200.00
Balance on hand January 1, 1897 .....	—
	\$459.58
	54.44
	—
	\$14.02

## REPORT OF PUBLICATION COMMITTEE.

In reporting at the close of this my fifteenth year as Chairman, I wish to express the gratification I feel on the result to the library of the Academy through these publications. In the year 1872 the number of bound and unbound volumes in the library was 311, most of these obtained by purchase. To-day our Librarian reports the number of books and pamphlets in the library at 33,955.\* These volumes come entirely through exchange and not from purchase. They bring us in touch with all scientific societies of the world and give us the latest scientific discoveries and most advanced thought.

Volume VI., about to be presented to the public, has been exactly four years in preparation and will contain the first entomological paper published since the pen and engraving tools of the late J. D. Putnam were laid aside in 1881.

I would like to remind the Davenport public that, while an endowment fund has made further aid in this work unnecessary for the present, there are other important objects in the Academy demanding their support.

The papers published during 1896 were: "A List of Coleoptera from the Southern Shore of Lake Superior, with Remarks on Geographical Distribution," by H. F. Wichkam, M.S., covering 45 pages; "Stone Mounds and Serpent of Hughes County, South Dakota," by John M. Helmick; "A Shell Gorget from Mexico," by Frederick Starr, Ph.D. (2 wood cuts); "A Revision of the Truxalinæ of North America," by Jerome McNeill, 96 pages. This paper is beautifully illustrated by six plates containing over one hundred drawings by the skillful hand of Miss A. Simonds, and engraved by the Boston Heliotype Company. Prof. Howard of the Agricultural Department, Washington, praises them very highly for perfection in drawing.

MRS. M. L. D. PUTNAM, *Chairman.*

## PRESIDENT'S ANNUAL REPORT.

EDWARD S. HAMMATT, January 6, 1897.

## MEMBERS OF THE ACADEMY, LADIES AND GENTLEMEN:

We are here tonight to review the work of the past year, and by its experiences be guided in shaping our course for the future. We have in the reports just laid before us a detailed statement of the work that has been done. The reports of the Finance Committee and Treasurer show that, while there is a small deficit, daily collections the coming year will readily balance this account. One of the best methods of relieving future Finance Committees of an irksome duty would be to provide for running expenses by endowments. This plan has already been suggested and well begun by Mrs. M. L. D. Putnam. If each

\* The number of books and pamphlets in the library at this date (May 16, 1899,) is 37,073.

of our members will coöperate with the Finance Committee to this end, sufficient funds could be raised to place the Academy on a sound financial basis and secure for it its just position as one of the important educational factors in the State.

The community at large does not realize the educational value of this organization. The late Prof. G. Brown Goode of Washington, in his annual report for 1895 on museums, says: "The degree of civilization to which any nation, city or province has attained is best shown by the character of its public museums and the liberality with which they are maintained." Permit me for a moment to remind you and the public in general that we are an organization not for self-aggrandizement or glorification, but exist, in the words of our constitution, for the purpose of "the increase and diffusion of knowledge of the natural sciences by the establishment of a museum, the reading and publication of original papers, and other suitable means." In the twenty-nine years of our life as an Academy much has been done to make good our claim to a more generous consideration by the public. We have an enviable reputation among scientists and scientific institutions of Europe, Australia, and America. In furtherance of the objects of our organization a course of training should be arranged to coöperate with that of the public schools. A rearrangement of case specimens should be made so as to provide for two classes of users, the public and students in science, the specimens for study to be removed under proper surveillance, while specimens for public view should not be handled. We have a standing committee for each of the various departments of science represented. Our By-Laws provide that they shall assist the Curator in arranging donations and deposits in the several departments. It should be made obligatory on those being honored by such appointments to give a small working interest to the museum needs and to make written reports on the condition of their departments. If this small amount of necessary time cannot be given to this work, would it not be better to abandon the museum committee?

We have been greatly favored the past year by two very interesting and important donations to our museum. The statement was made a year ago that one of its great needs was a mummy. One of our Vice-Presidents, Mr. C. Ficke, when about to start on his Eastern trip, intimated that this want might be filled. He was, therefore, promptly provided with the necessary credentials to the famous Boulaak Museum at Cairo, Egypt, through which he secured the fine specimen of mummy and case, from the 20th dynasty, which he generously presented as a gift to the Academy. This young woman of royal blood, who has been carefully deposited in a glass case modeled after those in the Field Columbian Museum, adds much to the interest of visitors.

With the Peary expedition to Greenland, the past year, was a life-member of the Academy, Mr. George R. Putnam of the U. S. Coast and Geodetic Survey. He was granted leave of absence to accompany the expedition in the interest of science for the Massachusetts

Institute of Technology. On his return he presented our museum with a fine specimen of an Eskimo kayak, together with a complete outfit of clothing and implements, all of which have seen actual service in Eskimo hunting and fishing. Among other donations to the museum was a valuable miscellaneous collection presented by Mrs. C. C. Parry. Richter & Son presented a unique specimen, the skin of a white skunk. A large number of stone implements have been received from Capt. W. P. Hall. Through Prof. Frederick Starr's interest the museum acquired by purchase a fine collection of Mexican pottery.

A particularly gratifying work has been done by the Publication Committee in so nearly completing Vol. VI. of the Proceedings. The paper on "A Revision of the Truxalinæ of North America," by Prof. Jerome McNeill, is in press and will soon be issued.

We have been asked during the past year to use our influence in the support of a congressional bill for the encouragement of the metric system. It seems strange to those who know its many advantages over other systems of weights and measures now in use that any opposition should be made to its use; least of all should we expect it from so distinguished a scientist as Mr. Herbert Spencer. His opposition to its use, published in a recent number of the *Popular Science Monthly*, has been ably answered in the same periodical by Prof. Mendenhall. Our Academy should exert its utmost influence to promote the general adoption of the metric system, and assist the metrological societies in distributing circulars of information on the subject.

The scientific societies of the District of Columbia have asked our coöperation in preventing the passage of a bill, in congress, against vivisection, or, more properly speaking, to restrict its use in the District of Columbia. Vivisection may be considered as one of the most efficient aids to medical science and its use in the hands of professional experts, for the advancement of science, should be unrestricted.

Our library should receive as prompt attention as possible. Binding and cataloguing are the two most pressing needs. In this connection some plan might be arranged for an interchange of books with the Library Association. This, however, cannot be accomplished until our library is catalogued. To the library should be added a reading-room well provided with current scientific periodicals. A number of these have been regularly received in the past. At the present time the number is too small for the actual requirements of students visiting the building.

A slight attempt has been made during the year to awaken more interest at our regular monthly meetings by having a paper read on some scientific topic. We have had five such papers: the first at the January meeting was read by Dr. Edward Gudeman, whose subject was "An Historical Review of Chemistry;" at the February meeting Prof. J. A. Udden of Augustana College read a paper on "An Exploration of Mounds in Kansas;" Mr. F. J. Walz, U.S. Signal Observer, read a paper on "Methods of Forecasting" at the March meeting.

In April, Prof. L. W. Andrews of the State University kindly gave us a lecture on "Some Phenomena Connected With Highly Rarified Gases." At the October meeting Mr. George R. Putnam gave a description of his experiences and study of Eskimo life while on the Peary expedition.

On looking over our membership list we find several additions the past year. We record with regret the loss of one of our earliest members, Mr. William Henry Holmes, who as Trustee and Vice-President, either in or out of office, was always an active member, with unbounded faith in the future prosperity and great usefulness of our organization. Prof. Charles Wachsmuth of Burlington, a distinguished palaeontologist and one of our corresponding members, has also been taken from us. Our published volumes bear testimony to his untiring research in his chosen field.

In surrendering the office of President which you have generously imposed upon me for two successive years, may I thank you for the honor conferred and your willing coöperation in Academy work.

The presentation of these reports was followed by the election of officers for the ensuing year, resulting as follows:

*President*—EDWARD S. HAMMATT.

*First Vice-President*—Dr. A. W. ELMER.

*Second Vice-President*—C. A. FICKE.

*Recording Secretary*—E. M. WHITE.

*Corresponding Secretary*—Dr. W. H. BARRIS.

*Treasurer*—Mrs. M. L. D. PUTNAM.

*Curator*—Dr. W. H. BARRIS.

*Librarian*—C. E. HARRISON.

*Trustees for Three Years*—Dr. JENNIE McCOWEN, EDWARD BORCHERDT, J. H. HARRISON, FRANK NADLER.

#### *January 28, 1897—REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; five members present.

The report of the Librarian for January showed 126 books and pamphlets and 3 bound volumes received.

New members were elected as follows: Mrs. Nettie Howard, F. Fidlar, C. J. Von Maur, A. J. Smith.

Standing Committees for 1897 were appointed as follows:

*Finance*—W. C. Putnam, J. B. Phelps, J. H. Harrison.

*Publication*—Mrs. M. L. D. Putnam, Prof. W. H. Barris, Dr. Jennie McCowen, Prof. S. Calvin, Dr. C. H. Preston.

*Archæology*—C. E. Harrison.

*Geology and Palæontology*—Prof. W. H. Barris.

*Conchology*—Miss S. F. Sheldon.

*Chemistry*—Frank Nadler.

*Zoölogy*—Dr. A. W. Elmer.

*Botany*—Louis Block.

*Historical Collections*—E. S. Ballord.

*Library*—Charles E. Harrison, Charles Francis, E. M. White.

The meeting then adjourned to hear the lecture on "Egypt," given by Mr. C. A. Ficke, under the auspices of the Academy, in the Presbyterian church. The seating capacity of the building was taxed to the utmost and all enjoyed the delightful and instructive account Mr. Ficke gave of his journey, illustrated by stereoptican views.

*February 26, 1897—REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; seven members present.

The Librarian reported the receipt of 124 books and pamphlets and 9 bound volumes during February.

Report of Curator: An archaeological specimen was received from Clarence B. Morse, from Ossabaw Island, Bryan County, Georgia—a large, exquisitely-shaped urn. He says it was originally covered with an inverted bowl of earthenware. In it were the fragments of a skeleton of a small child. Much decayed.

Publication Committee reports Volume VI. of the Proceedings finished, except index, and 100 copies of Prof. McNeill's paper sent him.

Frank W. Garstang and A. Vere Martin were elected to membership.

A committee of two, consisting of Dr. C. H. Preston and C. E. Harrison, was appointed to revise the membership list, all being in arrears two years or more to be dropped from the roll.

A report by the Lecture Committee was made on the lecture given by Mr. Charles Francis, C.E., upon "Egyptology," February 24th:

The Library of the Academy was crowded. Mr. Francis illustrated his lecture by drawings and explanations of the hieroglyphics, and spoke at length upon the construction of the Egyptian monuments from an engineer's standpoint.

The Lecture Committee further reported that arrangements were in progress for future lectures.

The Library Committee was instructed to prepare and issue a card index with the forthcoming volume of Proceedings.

*March 26, 1897 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair.

Librarian's report for February showed 117 books and pamphlets and 4 bound volumes received.

The Curator reported that the only additions to the museum were three specimens of gold from Cripple Creek, Colorado.

*April 30, 1897 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair.

The Librarian reported 121 books and pamphlets and 2 bound volumes received.

The Curator reported as follows:

A contribution from S. V. Proudfit, Washington, D. C., of a collection of stone implements from Mills County, Iowa, consisting of twelve boxes and six packages, numbered, labelled, and put up with the utmost neatness and care, accompanied with a complete catalogue of contents, and explanations of the same, equally painstaking and satisfactory. Two papers were also presented, "Antiquities of the Mission Bluffs" and "The Lodge Dweller," published by Mr. Proudfit.

Captain Hall reports the purchase from the mound fund of nine stone axes and thirty-seven flints from the vicinity of Rapids City.

The Corresponding Secretary was instructed to extend to S. V. Proudfit, over the seal of the Society, a vote of thanks for the valuable collection donated.

*May 28, 1897 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair.

The Librarian reported 158 books and pamphlets and 15 bound volumes received.

The Curator reported a gift of two large boxes from C. B. Moore from the shell beds of Georgia. The first contained a characteristic burial vase, but crushed into fragments in transit. The second contained a large shell cup; a series of unlabelled chisels, cups and gouges, all made of shell; a collection of large shell beads; another of excessively large forms; fresh water shells, punched and used for ornaments; the shell known as *fulgus carica*; fragments of pottery to show pattern; box of charred bone remains.

Captain Hall contributed one large celt and twenty flint implements purchased from the mound fund.

A committee consisting of Dr. C. H. Preston and J. H. Harrison, appointed to draft resolutions on the death of Mrs. Nettie F. Howard, reported as follows:

*Resolved*, That in the death of Mrs. Nettie Fidlar Howard, the efficient manager of the Davenport Associated Charities, on May 11, 1897, this Academy has lost a valued member whose life, active in good works, made her an honor to all with whom her lot was cast.

*Resolved*, That we sympathize with the bereaved relatives; that these resolutions be spread upon the records of the Academy and copies supplied to the local press.

C. H. PRESTON, }  
J. H. HARRISON, } Committee.

On motion, the President was authorized to procure a current copy of the "Naturalists' Directory."

No meetings were held in June or July.

*August 27, 1897 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair.

The Librarian reported for June, July and August, 253 books and pamphlets and 20 bound volumes received.

The Curator reported the following additions to the museum in June:

A large, fine specimen of "*Tubipora musica*," and from the tropical seas the beautiful nautilus, known as the *Nautilus pompilius*, both donated by Mrs. Elizabeth Holmes.

In July: A beautiful specimen of Calcarous Tufa from Oliver Allen, Jr., of Mumford, New York.

In August: A collection of thirty flint implements from Captain Hall, purchased by the mound fund.

Henry Vollmer was elected to membership.

The death of Mr. John C. Bills, a regular member, was announced, and a committee was appointed to prepare suitable resolutions.

*September 24, 1897 — REGULAR MEETING.*

Dr. C. H. Preston, Acting President, in the chair.

The Librarian reported 167 books and pamphlets and 13 bound volumes received.

The Curator reported a gift from Rev. Irving M. Channon, missionary at Kusae, Caroline Islands, of a noteworthy collection of interesting articles bearing on the character, life work and habits of the inhabitants of these islands, consisting of a model of a family canoe, with mast and rigging, from Montlock Islands; a model of loom and samples of thread from Kusae Island; a tastefully made ornamented fan from Marshall Island; a mat from Gilbert Island; one belt, three clubs and a cane from Rük Island; three "tolls," or loin cloths, from Kusae Island; two mats and cloth of bark from Rük Island; one set of ear-rings from Rük Island; one cocoanut shell cup from Rük Island; two baskets from Gilbert Island; one fashionable hat, sixteen ocean shells, one girdle used during pregnancy, seven photographs of natural scenery, villages, etc., from Caroline Islands; one necklace of ocean shells, one necklace of pandanis leaf, from Gilbert Island. Together they fill to overflowing a show-case donated by J. C. Tilton.

Rev. Mr. Demarest of Pena Blanca, New Mexico, and Rev. Irving Channon of Kuzaie, Caroline Islands, were elected corresponding members. A vote of thanks of the Academy was tendered Rev. Irving M. Channon for the valuable collection of South Sea curios presented.

*November 26, 1897 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; six members present.

The Librarian reported for October and November 107 books and pamphlets and 5 bound volumes received.

In the Library of the Academy, George R. Putnam, of the United States Coast and Geodetic Survey, gave a lecture on Alaska and a description of his summer's work on the Pribylof, or Seal Islands in Behring Sea. He spoke of the habits of the natives of the Aleutian Islands as he came in contact with them, and also of the preservation and destruction of the seals. The lecture was illustrated by maps and specimens from the collection of the Academy.

*December 31, 1897 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; seven members present.

The Librarian reported 112 books and pamphlets and 4 bound volumes received.

The application for life membership of E. K. Putnam was received.

The Presbyterian Church property, corner of Seventh and Brady Streets, being in the market, it was moved and carried that if the Academy could find ways and means of doing so, it be purchased.

The President appointed as Nominating Committee for officers for 1898, E. M. White, Dr. C. H. Preston and Frank Nadler.

*January 5, 1898 — ANNUAL MEETING.*

Edward S. Hammatt, President, in the chair; eight members present.

The minutes of the annual meeting, January 6, 1897, were read and approved.

TREASURER'S REPORT.

RECEIPTS.

Balance on hand, January 1, 1897 .....	\$140.20
From F. Nadler, Treasurer, 1896 .....	43.96
Annual subscriptions .....	285.00
Donations .....	30.00
Dues .....	183.00
Initiation fees .....	20.00
Lectures and receptions .....	30.00
Door receipts .....	49.98
Interest .....	133.44
Total receipts .....	\$915.67

EXPENDITURES.

Paid Dr. W. H. Barris, Curator .....	\$500.00
Janitor .....	84.25
Fuel .....	61.54
Lights .....	11.86
Water .....	12.00
Repairs and improvements .....	116.46
Clerical assistance .....	13.35
Chairs .....	25.00
Printing, stationery, etc .....	24.10
Captain W. P. Hall, for collecting .....	5.00
Postage, express and incidentals .....	48.25
Total expenses .....	\$901.81
Balance on hand .....	\$ 13.86

Respectfully submitted,

MARY L. D. PUTNAM, Treasurer.

STATEMENT OF ENDOWMENT FUNDS OF THE ACADEMY.

General contribution fund, raised 1883, drawing interest at 7 per cent .....	\$ 1,200.00
Bequest of Mrs. J. Monroe Parker, payable when \$5,000 has been raised for building purposes .....	1,000.00

Bequest of J. Monroe Parker .....	1,000.00
Putnam Memorial Fund for endowment of publication, established by Mrs. Mary L. D. Putnam with funds bequeathed by Mrs. Mary Putnam Bull .....	9,500.00
	<u>\$12,700.00</u>

## RECAPITULATION.

Receipts General Fund .....	\$915.67
Publication account .....	772.58
Grand total receipts .....	<u>\$1,688.25</u>
Expended General Account .....	\$901.81
Publication account .....	760.80
Grand total expenditures .....	<u>\$1,662.61</u>
Balance on hand, General Account .....	\$ 13.86
Publication Account .....	11.78
	<u>\$ 25.64</u>
	<u>\$1,688.25</u>

Respectfully submitted,

January 1, 1898.

MARY L. D. PUTNAM, *Treasurer.*

The Treasurer's report was ordered referred to the Auditing Committee.

For the year 1897 correspondence was as follows: Letters received, 184; letters and acknowledgments made, 241.

Very respectfully,

W. H. BARRIS, *Corresponding Secretary.*

## REPORT OF RECORDING SECRETARY.

During the year 1897 there have been twelve regular meetings of the Academy. The average attendance has been six.

Seven regular, one life, and three corresponding members have been added during the year.

Two members have died: Hon. John C. Bills and Mrs. Nettie F. Howard.

Lectures have been delivered by C. A. Ficke on "A Trip Up the Nile;" by Charles Francis on "Egyptian Hieroglyphics," and by George R. Putnam on "The Seal Islands and Alaska."

E. M. WHITE, *Recording Secretary.*

## LIBRARIAN'S REPORT.

Your Librarian would report for the year just closed a very satisfactory condition of the Library. At the beginning of the year the Trustees made a small appropriation for binding, a work greatly needed for the preservation of very many valuable books; but owing to a pressure of funds necessary in other directions the money was not called for. The only expense incurred was about twenty-five dollars expended in classifying and arranging the Library, a work made necessary after the new shelving was put in last year. Much credit

must be given Professor Barris and Mr. Robert P. Osborn for the extensive work accomplished by them in this department. The number of books and pamphlets received since my last annual report is 1,519, 76 of which are in substantial permanent binding. That the members may more fully understand the rare value of our library, I have prepared and herewith submit a partial list of societies in this country from which we receive books in exchange:

Harvard University, Canadian Journal of Science, National Science Association of Staten Island, Scientific Association of University of Missouri, Boston Society of Natural History, New York Botanical Garden, Canadian Institute, Chicago Academy of Science, Texas Academy of Science, Johns Hopkins University, State Historical Society of Wisconsin, Minnesota Historical Society, Portland Society of Natural History, Kansas Academy of Science, American Antiquarian Society, American Academy of Arts and Sciences, St. Louis Academy of Sciences, American Philosophical Society, American Museum of Natural History, Colorado Scientific Society, Torrey Botanical Club, Harvard College, University of California, Illinois Museum of Natural History, Philadelphia Academy of Science, Zoological Society of Philadelphia, Chicago Historical Society, Field Columbian Museum, California Academy of Science, Entomological Publication, National and State Geological Surveys and Reports, Reports on Forestry, Botany, Chemistry, Experiment Stations, Animal Industries, etc., from the Department of Agriculture, Patent Office Gazette, Fish Commission, Coast and Geodetic Surveys, Smithsonian Reports, etc., in all, about one hundred societies and departments.

From foreign countries we receive exchanges as follows: Canada, Mexico, Africa, 3; South America, 15; Asia, 1; Australasia, 5; Austro-Hungary, 13; Belgium, 9; Denmark, 2; France, 31; Germany, 45; England, 14; Ireland, 3; Scotland, 9; Italy, 12; Netherlands, 3; Norway, 7; Portugal, 2; Russia, 4; Spain, 1; Sweden, 7; Switzerland, 11; Bulgaria, 1; in all, 198 foreign Societies contributing regularly through exchange for our publications to the building up of this vast storehouse of scientific lore. I have in previous reports urged the necessity of binding and indexing, a work requiring considerable time and expense to complete. I trust the Academy will speedily enter upon this most important work.

Respectfully submitted,

C. E. HARRISON, *Librarian.*

#### REPORT OF PUBLICATION COMMITTEE.

Your Committee on Publication reports as follows:

Early in the past year, Vol. VI. of the Proceedings, begun in 1892, was brought to completion, and the usual edition of 1,500 copies, with 200 separate for authors, was printed. Of these 374 have been distributed to home and foreign exchanges and to regular members, and

the remainder are stored in the Academy building. The volume has been very favorably received, and, we believe, fully sustains the reputation of its predecessors. Of its ten papers the most important are those on entomology, contributed by Prof. Jerome McNeill, of the University of Arkansas, and Prof. H. F. Wickham, of the State University of Iowa, and a summary of the archaeology of Iowa by Prof. Frederick Starr, of the University of Chicago. The illustrations of the volume comprise six entomological plates, a number of wood cuts, and an engraved portrait of Dr. C. C. Parry accompanying a biographical sketch by Dr. C. H. Preston, and a list of his published writings. The synopsis of Proceedings is brought down to the beginning of the year 1897 and a comprehensive index is appended. One hundred and ninety-two pages of the three hundred and ninety-two pages of this volume were printed during the past year; also the first forty-four pages of Vol. VII. Forty more are now ready for the press. The first paper in Vol. VII. is "A Memoir (with portrait) of Charles Edwin Putnam," by W. C. Putnam; the second an article on "Our Local Geology," by Prof. W. H. Barris, and the third, "A Study of the Census of the Pueblo of Cochite, New Mexico," by Prof. Frederick Starr. A fourth paper which, with its illustrations, will cover about sixty pages additional, and which is the joint contribution of Prof. Herbert Osborn, entomologist of the Iowa Experiment Station at Ames, and Mr. Elmer D. Ball, is all in type. It is entitled "Studies of North American Jassoidea," and is a continuation of papers presented before the Iowa Academy of Science entitled "Contributions to the Hemipterous Fauna of Iowa." This valuable paper will be illustrated by six plates, the expense of which is met by the Experiment Station.

The financial report of the publication for the year is as follows:

RECEIPTS.

Balance on hand January 1, 1897 .....	\$ 20.79
From interest on Putnam Fund to February 1, 1898 .....	712.50
Interest on bank deposits .....	6.29
Sale of publications .....	8.00
Donation .....	25.00
Total receipts .....	\$772.58

EXPENDITURES.

Paid	Printing .....	\$385.80
	Plates.....	275.00
	Clerical work.....	100.00
	Total expenditures .....	\$760.80
	Balance on hand .....	11.76
		\$772.58

Respectfully submitted,

MARY L. D. PUTNAM,

*Chairman Publication Committee.*

Dr. W. H. Barris was called to the chair and the President's address was read.

PRESIDENT'S ANNUAL REPORT.

EDWARD S. HAMMATT, January 5, 1898.

MEMBERS OF THE ACADEMY, LADIES AND GENTLEMEN:

Much occurs each successive year in the life of scientific bodies which is but a repetition of the work of past years. We therefore find a great sameness in regular reports. Yet it is only by such detailed reports that the outside world can judge of our right to live.

We have a fair-sized membership, among whom are a few with genuine interest in scientific matters. But the greater number are quite too indifferent to the pleasure and benefit of attendance upon the regular meetings of the Academy.

It has been suggested that we change our regular monthly to quarterly or less frequent meetings, at which the only business should be the reading and discussion of topics of scientific interest. We find that some years ago a resolution was adopted providing for one hour of scientific discussion at each regular meeting. If this resolution were revived and notice of the subject of discussion sent to each member it would certainly give greater interest to our meetings and increase the attendance. We see from the reports of the Finance Committee and Treasurer that the Academy finances have been judiciously managed during the past year. There has been an encouraging growth in the museum collections. The most notable specimens were added to the department of ethnology and consisted of native work from the South Sea Islands, collected and presented to the Academy by the Rev. Irving M. Channon; also a collection made by Mr. E. K. Putnam in Norway, Sweden and England, of native implements, mineralogical specimens and a Norwegian burial urn. Mr. George R. Putnam presented us with many interesting specimens collected while on the Aleutian Islands the past summer. The museum has been enriched by two fine specimens of ornamented burial cases, and a large number of stone implements from Georgia, presented by Mr. Clarence B. Moore of Philadelphia. Mr. S. V. Proudfit presented the Academy with a large collection of stone implements.

Mention must also be made of hundreds of Indian implements, secured through the generous interest of Capt. W. P. Hall. Beside these, we have received many smaller donations of specimens from various sources. It may be well to remember that the value of a museum is greatly enhanced by the exercise of judicious care in the selection of specimens. As this becomes annually more apparent from lack of space, a careful revision of specimens in each department of the museum should be made by the Museum Committee, with recommendations to the Academy for the removal of such as can be dispensed with. This will serve to increase the value of our collections and somewhat relieve our overcrowded shelves. It is hoped that during

the coming year we may secure a series of specimens from the United States Geological Survey arranged for distribution for educational purposes. Application has been filed with the Survey for this series. The Library has received many valuable additions by exchange with foreign Scientific Societies. Special mention must be made of a series of government publications, giving the Messages and State papers of the Presidents of the United States. This set of books was secured through the interest of Hon. G. M. Curtis, to whom the Academy is indebted for this and other acts of courtesy. We take pleasure in recording the completion, early in the year, of Vol. VI. of the Academy Proceedings. Several papers of importance have also been published since our last annual meeting, as parts of Vol. VII. of the Academy Proceedings. These papers are, "A Memorial of Mr. C. E. Putnam," one of our former Presidents, written by his son, Mr. W. C. Putnam; a paper on "Our Local Geology," by Prof. W. H. Barris, a paper called "A Study of a Census of the Pueblo of Cochiti, New Mexico," by Prof. Frederick Starr, and a paper entitled "Studies of North American Jassoidea," by Prof. Herbert Osborne and Prof. E. D. Ball. We have had several interesting and instructive lectures during the year, the first by Hon. C. A. Ficke, describing his trip up the Nile the preceding year. This was followed by a lecture by Mr. Charles Francis on "Egyptian Hieroglyphics." Upon the return of Mr. George R. Putnam from his summer work for the United States Coast and Geodetic Survey on the Pribyloff Islands, he gave us an interesting lecture on "The Seal Islands and Alaska."

It is with regret that we record the loss of two of our members during the past year. In the death of Hon. John C. Bills the city mourns one of its most honored and influential citizens, and the Academy, a warm advocate and friend, while in the untimely death of Mrs. Nettie Howard the Academy loses an interested, active member.

At the last annual meeting two honorary members were elected and during the year one life member, three corresponding and seven regular members.

We have but lately passed our thirtieth anniversary. Of those who met and organized the Davenport Academy of Natural Sciences on the 14th day of December, 1867, few are with us now. But we have before us in the work accomplished a glowing tribute to the founders of the Academy. In glancing backward over this period we cannot but feel, with the limited means at our disposal, we have won an honorable position in the scientific world and have stamped a character on this fair city such as no other organization in our midst has done. In exchanging our publications with Scientific Societies in every part of the world we are doing a work which continually redounds to the honor of this community. When this work is fully appreciated by our citizens we shall have the generous recognition to which we are entitled.

On motion a vote of thanks was tendered Hon. George M. Curtis for securing a set of "The Messages and Documents of the Presidents of the United States" for the Academy.

Honorary members elected:

Henry B. Osborn, of Iowa Experimental Station, Ames, Iowa.

Prof. B. F. Fernow, Chief Division of Forestry, Washington, D. C.

Dr. John S. Billings, Surgeon General U. S. A., Washington, D. C.

Dr. Henry S. Pritchell, Superintendent United States Coast and Geodetic Survey, Washington, D. C.

Prof. Robert Etheridge, National Museum, South Kensington, England.

Life member, E. K. Putnam.

The Nominating Committee reported the following list of nominations for officers for 1898:

*President* — EDWARD S. HAMMATT.

*First Vice-President* — Dr. A. W. ELMER.

*Second Vice-President* — C. A. FICKE.

*Recording Secretary* — E. M. WHITE.

*Corresponding Secretary* — Prof. W. H. BARRIS.

*Treasurer* — Mrs. M. L. D. PUTNAM.

*Trustees for Three Years* — Dr. W. L. ALLEN, C. A. FICKE, Dr. C. H. PRESTON, J. B. PHELPS.

*Trustee to Fill Vacancy* — Prof. W. H. BARRIS.

On motion of Rev. A. M. Judy the Secretary was instructed to cast the ballot of the Academy for officers as reported by the Nominating Committee, which was done, and they were declared elected.

Prof. H. B. Osborn being present, the President called on him for a short talk, which he gave on the San José scale.

*January 7, 1898 — TRUSTEES' MEETING.*

Edward S. Hammatt, President, in the chair; seven Trustees present. The Minutes of the Trustees' meeting, January 23, 1896, were read and approved.

A general discussion followed on the outlook of the Academy.

Mrs. Putnam, as Treasurer, made a verbal report that no indebtedness exists against the Academy.

Mr. C. A. Ficke suggested the Academy offer the Trustees of the Presbyterian Church the sum of \$3,500 for the adjoining lot south of the Academy, and that the Church provide five life members.

*January, 28, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; five members present. Minutes of previous meeting read and approved.

The Librarian reported 104 books and pamphlets and 3 bound volumes received.

**Report of Curator:** The only addition made to the museum this month is from Mr. Edward Staunton, who gathered some excellent specimens of common mica from Mt. Pisgah, in the Adirondacks near Saranac Lake, New York. The crystals are of a peculiar form. The associated minerals are at present undetermined.

Moved and carried that the metric system of weights and measures be hereafter required by the Academy in all records, labels and articles for publication.

New members were elected as follows: Miss R. Renwick, Miss M. Renwick, William M. Lillis.

Mr. E. K. Putnam was invited to give a talk at the regular February meeting on the "Stone Age in Scandinavia," illustrated by specimens in the Academy.

A cast of an Egyptian hieroglyphic was presented by Sigmund Shalon, representing Horus offering the Key of the Nile to Amor Ra.

The President appointed the following Committees for 1898:

*Archæology* — C. E. Harrison.

*Geology* — Prof. W. H. Barris.

*Conchology* — Miss S. F. Sheldon.

*Zoölogy* — Dr. A. W. Elmer.

*Botany* — A. A. Miller.

*Entomology* — Prof. H. B. Osborn.

*Finance* — J. B. Phelps, C. A. Ficke.

*Publication* — Mrs. M. L. D. Putnam, Prof. W. H. Barris, Dr. Jennie McCowen, Prof. S. Calvin, Dr. C. H. Preston.

*Library* — C. E. Harrison, Charles Francis, E. M. White.

*January 28, 1898 — TRUSTEES' MEETING.*

Edward S. Hammatt, President, in the chair; four members present. The resignation of Ferdinand J. Walz, owing to removal from the city,

was tendered and accepted. As insurance expires on the 30th, it was recommended that insurance be placed as follows:

Building .....	\$1,500.00
Cases and furniture .....	500.00
Collections .....	2,000.00
Library .....	1,000.00      \$5,000.00

*February 25, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; six members present. The minutes of the previous meeting read and approved.

The Librarian reported 133 books and pamphlets and 24 bound volumes received.

The Curator reported an addition to the museum of an old-time pair of spectacles (silver frame) with metal case, donated by Miss C. M. Holmes.

J. H. Hass was elected to regular membership and A. A. Miller to corresponding membership.

The president reported progress on the cataloguing of the Library.

*March 25, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; six members and two visitors present.

The Librarian reported 164 books and pamphlets and 27 bound volumes received.

The Curator reported: The Academy is again under obligations to Clarence B. Moore for the addition to its museum of an unusually large fossil oyster from Griffin's Landing, Burke County, Georgia, found on the Savannah River, 147 miles above Savannah.

There was a discussion on the importance to the Academy of securing manuscripts, books, pamphlets, newspapers, prints and other matter bearing on local history, it being pointed out that the Academy has a large amount of such material on hand and that the present time is the best for making the collection more complete.

*March 31, 1898 — CALLED MEETING OF THE TRUSTEES.*

The Trustees met at the Academy at 4:30 P. M; six members present. On motion, Hon. C. A. Ficke was made Chairman and Edward Borcherdt Secretary.

The following resolution by C. E. Harrison was adopted:

*Resolved*, That the Davenport Academy of Natural Sciences hereby expresses its appreciation and full satisfaction with the arduous work of Miss Alice M. Beach in arranging the Academy library for cataloguing its contents.

Mrs. Putnam, as a Committee of one, reported concerning the purchase of the Presbyterian Church property. The Trustees of the church offered the property for \$6,000, \$500 to be paid when the Academy takes possession.

The following resolution by Dr. C. H. Preston was adopted:

*Resolved*, That Mrs. M. L. D. Putnam, Mr. C. A. Ficke and Maj. G. P. McClelland be appointed a committee with power to act in the matter of the purchase of the Presbyterian Church property, corner of Brady and Seventh streets.

*April 30, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair. The minutes of the previous meetings read and approved.

Treasurer's report received and placed on file.

The Librarian reported 148 books and pamphlets and 10 bound volumes received.

In addition to those thus obtained by way of exchange, other important accessions have been made. The whole entomological library known as that of J. Duncan Putnam's has been formally catalogued and numbers 270 volumes.

From a private library sixty-seven volumes have been received. A collection of sixty-one volumes, mostly government publications, some of them extremely rare, was contributed by Dr. S. C. Bowman of Andalusia; from Prof. Barris we have forty volumes, mainly on geology and palæontology, none of which were previously in the library—a total of 596.

The Curator reported the following additions to the museum from Dr. S. C. Bowman of Andalusia: One pair of exquisitely prepared and mounted deer-horns, two large birds separately mounted, two cases of birds, the larger containing twenty-six, with name and locality of each; the smaller, seven; also alcoholic preparations of reptiles from western Texas and Mexico.

Capt. Hall reports the purchase of a stone axe and thirty-seven flint implements, paid for from the mound fund.

E. H. Whitcomb and A. A. Miller were elected to regular membership (the latter from corresponding membership).

*May 28, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; six members present.

George M. Bechtel was elected to regular membership.

Prof. Barris, appointed to draft resolutions on the death of Dr. Samuel C. Bowman of Andalusia, Illinois, reported as follows:

*Resolved*, That in the death of Dr. S. C. Bowman of Andalusia the Academy has lost a most generous and worthy member — one who for years has contributed largely to its museum. As a slight tribute to his memory we place on record our hearty appreciation of his many and valuable services. To friends and relations of the deceased, at home and abroad, we extend our most hearty sympathy.

W. H. BARRIS, *Committee.*

Drs. Allen and Preston were appointed a committee to draft resolutions on the death of William Stevens Perry, Bishop of Iowa, and reported:

WHEREAS, This Academy has lost in the death of William Stevens Perry, Bishop of the Episcopal Church in Iowa, an able and honored member, be it

*Resolved*, That this Academy place on record this testimonial of regard for the high literary ability and intellectual power of Bishop Perry, and as a token of appreciation of the high degree of education and professional eminence he attained.

*Resolved*, That in tribute to his memory these resolutions be inscribed upon our records and a copy thereof be sent to his bereaved niece.

WILLIAM ALLEN. }  
C. H. PRESTON. } *Committee.*

The Librarian reported 120 books and pamphlets and 34 bound volumes received. Of these bound volumes 24 are from the Department of Agriculture to complete sets; the balance come by way of exchange.

The Curator reported the following additions to the museum: From Mrs. Dr. C. C. Parry, a collection of Dr. Parry's botanical papers; a series of pressed botanical specimens; one box containing nearly forty species of minerals, fossils, etc., mostly labelled; an extraordinary pre-historic relic; obsidian arrow-points from Mexico; nest of five small species of iris from California; glassful of broken shells from shell bank; forms of *doscirna* and *ophivaroid* from the Pacific coast; a sack made in Mexico from native fibre; example of plain, modern pottery; three tourists' thermometers.

*June 24, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair. The minutes of previous meeting read and approved.

The Librarian reported 132 books and pamphlets and 5 bound volumes received.

The Curator reported: The Academy has received from Mrs. M. L. D. Putnam a small collection of ocean shells from Cape Cod. Seven or eight species are new to our collection.

Rev. J. B. Donaldson was elected to life membership.

A paper by Prof. Frederick Starr on "Notched Bones from Mexico" was received for publication.

*September 30, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair.

The Librarian reported 355 books and pamphlets and 15 bound volumes received.

The Curator reported additions to the museum as follows: In July, from Capt. Hall, a collection of flint implements and three stone axes, from the mound fund. Mr. Webb Ballord donated a collection of 140 birds' eggs, unclassified. Mrs. H. M. Mandeville has presented a collection of mounted birds; also jars containing a centipede and tarantula; also a spinning-wheel for spinning flax.

In August, Mrs. M. D. Westlake presented a Japanese opium pipe.

In September, Capt. Hall contributed from the mound fund a small collection of pre-historic implements. Among these are a peculiar shaped stone gouge, one side concave the other grooved for attachment to handle; one small hematite axe; eight flints; a small collection of fossils from the Port Byron limestone and a modern knife of red pipestone. An extraordinary fine stone implement was contributed by W. R. Minnist of Gratz, Kentucky, through Mr. J. H. Harrison.

*October 28, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair.

The Librarian reported 110 books and pamphlets and 7 bound volumes received.

The Curator reported as follows: Mrs. H. M. Mandeville has donated to the museum a medium-sized vase found in a mound on the Mandeville farm near this city. The neck bears two opposite handles, alternating with two projections, the whole peculiarly ornamented. To George M. Croft of Summitville, Iowa, the Academy is indebted for

the gift of eighteen species of ocean and fresh water shells, twenty fine specimens of minerals and three fossils from Carbon County, Wyo.

Papers by Prof. H. B. Osborn on "Entomology of New Mexico," and by Prof. T. D. A. Cockerell on "The Genus *Pediopsis*," were presented and read by title.

The President appointed a committee for the nomination of officers for 1899, consisting of Edward S. Hammatt, Prof. W. H. Barris, and E. M. White.

*November 28, 1898 — REGULAR MEETING.*

Edward S. Hammatt, President, in the chair; six members present.

The Treasurer's report was received and placed on file.

The Librarian reported 122 books and pamphlets and 5 bound volumes received.

The Curator reported as follows:

The Academy has received from Dr. Samuel H. Scudder an addition to its entomological collection of three specimens of the rare *Stagnanellus Carolina*, which he has recently described. Mr. Joseph Parry has donated an interesting series of minerals comprising actinolite, both in crystalline and massive forms, the same with steatite and garnets; steatite quartz in massive as well as clusia forms. Iron pyrites, incrusting mineral and calcite, mainly from Vermont. There are also two imperfect stone axes from Fort Edwards. A curiosity of some interest is a cake of Bayberry tallow; also a candle made of it, Mr. Parry thought in use on Long Island prior to the use of oil, gas or ordinary tallow.

From Mr. Dunbar D. Beck the Academy has received an interesting series of calcareous concretions of spherical form. They are most generally found imbedded in thick sandstone and of the carboniferous age. Deserving a place in the Historical Department of the Academy is a piece of Uncle Sam's Santiago war balloon, presented by Sergeant John A. Miner of the U. S. Signal Service, with account of the same.

*December 30, 1898 — REGULAR MEETING*

Edward S. Hammatt, President, in the chair.

The Librarian reported 105 books and pamphlets and 3 bound volumes received.

The Curator reported deposited by Webb Ballord a jar of crinoids gathered on the Bahama expedition, of which he was a member, and dredged from the same localities in which Prof. Alexander Agassiz found his first living crinoids.

Received of Prof. H. F. Wickham of the Iowa State University nearly two hundred specimens of *coleoptera* from the Lake Superior regions. They are of special interest to the Academy as part of the material treated of in the Proceedings published two years ago (Vol. VI., pages 125-169).

A committee consisting of Rev. J. B. Donaldson, Mrs. M. L. D. Putnam and Dr. C. H. Preston was appointed to draft resolutions of regret on the death of Maj. G. P. McClelland and to report at the next meeting.

The Recording Secretary was instructed to write to Mr. William H. Ballou of New York City that the probabilities were the Academy would be represented by active members at the Eighth International Geological Congress, to be held in Paris in 1900, and his appointment as a representative could not at present be considered.

#### REPORT OF THE CURATOR FOR THE YEAR 1897.

Additions were made to the museum as follows:

From Clarence B. Moore, Philadelphia, a burial urn from Mound A., Middle Settlement, Ossabaw Island, Bryan County, Georgia. It had been originally covered with an inverted bowl of earthenware, over the fragments of a skeleton of a small child, much decayed.

Three specimens of gold in quartz from Cripple Creek, donor unknown.

From Capt. Hall, purchased by the Mound Fund, nine rather rough stone axes, and thirty seven flint implements from Pleasant Valley.

From Mr. J. V. Proudfit of Washington, D. C., a collection of stone implements from Mills County, Iowa. They are contained in twelve small boxes and six packages, numbered, labelled, and put up with the utmost care. A catalogue accompanies the gift, with notes. Also two papers written by the giver, entitled "Antiquities of the Missouri Bluffs," and "The Cave Dwellers."

From Capt. Hall, purchased with funds from the Mound Fund, one large celt and twenty-two flint implements.

From Clarence B. Moore, two boxes. The first contained another burial urn, somewhat crushed in transit, but completely restored by Mr. Charles E. Harrison. The second contained one large drinking vessel, twelve smaller forms, one box of ordinary shell beads, another of extraordinary large forms, thirteen cores of conch shells, one package fragments of pottery, one box of burned human bones, one box of river shells each pierced at the apex, five specimens of the *Fulgar canaca* perforated and showing wear at the beaks, one fine stone celt and two fragments of rock, all labelled, giving localities where found, and their marks and peculiarities.

From Mrs. Margaret Holmes, a large specimen of the coral known as the *Tubipora musica*; also a specimen of the *Nautilus pompilius* of Linnaeus.

A small collection of flint implements—about thirty—from Capt. Hall.

J. C. Tilton donated to the Academy, for its Museum, a case and stand.

From Oliver Allen of Mumford, N. Y., specimens of *Calcareous tufa*, of which their church was built.

From the Rev. Irving M. Channon, missionary to and residing at Kusae, one of the Caroline Islands of the Micronesian Group, an interesting collection bearing upon the life, work, and habits of the inhabitants. The following is a list: A model of the family canoe, from the Montlock Islands; a loom, work, and samples of thread from the Kusae Islands; three tols or loin cloths woven and from the Kusae Islands; a fan, figured and embroidered, from the Marshall Islands; two baskets, a mat, and a hat, from the Gilbert Islands; a belt, three clubs, a cane, two mats of cloth of bark, a set of ear-rings and a cocoanut cup from the Ruk Islands; sixteen ocean shells, and a girdle used in pregnancy, from the Caroline Islands; a necklace of shells, another of pandanus leaf, from the Gilbert Islands; seven photographs of buildings, church, and natural scenery.

From George R. Putnam, a collection from Alaska: lava, augite crystals and sand from St. Paul's Island; tooth of the walrus, teeth of the sea-lion and fur seals; the skull of a young seal, and a bag made from the intestines of the sea-lion; fire-making apparatus from the Eskimo settlements of North Alaska; two remarkably fine sea urchins from the Aleutian Islands; collection of ocean shells from Japadui Bay; basket and tobacco pouch from Otter Island. Mr. Putnam also presented what was thought to be the hardened cartilage that separates the vertebra of the whale.

From Mr. Edward K. Putnam, specimens of pottery and a burial urn ornamented and enclosing charred human remains; one bronze axe, one grooved stone hammer, another pierced for a handle, two large celts, one elongated spear, a shorter form, one three-sided, slightly built and delicate, three curved flint knives, and two small arrow points, mainly from Denmark.

From Mrs. Putnam, an anemone from Whitby, England; specimens of hematite from Lake District, west coast of England; four large specimens from the Cleatore Ore Mine; thirty-seven choice specimens including various hematitic forms with crystals of quartz, fluor-spar and associated rock; a sea urchin from the Isle of Guernsey; garnets from Norway.

From Miss L. Dickenson, Sunderland, England, a box of native wood decorated by burnt etching; a fine model of Nansen's last sled.

From Clarence B. Moore, for framing, a lithograph of a large cinerary urn showing as contents human bones, the cranium, limbs, and upper ribs, accompanied with large shell beads.

From Capt. Hall, a large grooved stone axe, an equally large celt, and over seventy flint implements, with grooved axe and flints collected by Samuel and Isaac Wainright.

## ELECTIONS TO MEMBERSHIP.

DECEMBER 14, 1867, TO JUNE 1, 1899.

#### HONORARY MEMBERS.

\* Deceased

\*Baird, Spencer F., Wash., D.C. Apr. 27, '77  
 Billings, J. S., New York City . . . Jan. 5, '98  
 Calvin, Samuel, Iowa City, Ia. . . Jan. 18, '99  
 \*Carpenter, W. B., London, Eng. . . Jan. 3, '77  
 \*De Candolle, Alphonse, Geneva,  
     Switzerland . . . . . Jan. 3, '77  
 Etheridge, Robert, South Kens-  
     ington, Eng. . . . . . Jan. 5, '98  
 Fernald, B. E., Ithaca, N. Y. . . Jan. 5, '98  
 \*Gray, Asa, Cambridge, Mass. . . Jan. 3, '77  
 \*Hagen, H. A., Cambridge, Mass. Jan. 2, '84  
 \*Henry, Jos., Washington, D.C. . . Jan. 3, '77  
 Hooker, Joseph D., Kew, Eng. . . Jan. 3, '77  
 \*Kirland, J. P., Cleveland, O. . . Jan. 3, '77  
 \*Le Conte, J. L., Philadelphia, Pa. Jan. 3, '77  
 McBride, T. H., Iowa City, Ia. . . Jan. 18, '99  
 Moore, C. B., Philadelphia, Pa. . . Jan. 2, '95  
 Nutting, C. C., Iowa City, Ia. . . Jan. 18, '99  
 Oshorn, Herbert, Columbus, O. . . Jan. 5, '98  
 Pritchett, H. S., Washington, D.C. Jan. 5, '98  
 Starr, Frederick, Chicago, Ill. . . . . Jan. 7, '96  
 \*Westwood, J. O., Oxford, Eng. . . Jan. 3, '77

## CORRESPONDING MEMBERS.

**It has been found impracticable to designate the deceased in this list.**

Calkins, W. W., Chicago, Ill. .... Jan. 25, '78  
 Calvin, Prof. S., Iowa City, Ia. .... Apr. 27, '77  
 Canby, W. M., Wilmington, Del. .... Apr. 27, '77  
 Cardwell, Dr. J. R., Portland, Or. .... Nov. 5, '80  
 Carpenter, Dr. H., Portland, Or. .... Nov. 5, '80  
 Carr, Lucien, Cambridge, Mass. .... Apr. 27, '77  
 Caton, J. D., Ottawa, Ill. .... Apr. 27, '77  
 Chambers, V. T., Covington, Ky. .... Apr. 27, '77  
 Channon, Rev. Irving M., Kusaie, Caroline Islands. .... Sept. 14, '97  
 Chapman, Dr. A. W., Apalachicola, Florida. .... June 29, '77  
 Chapman, W. A., Okalona, Ark. .... Nov. 27, '85  
 Christopher, J. W., New York. .... Dec. 31, '80  
 Clarke, Robt., Cincinnati, O. .... June 29, '77  
 Claypole, Dr. E. W., Antioch Col., Ohio. .... Nov. 5, '80  
 Cleveland, D., San Diego, Cal. .... June 29, '77  
 Clinton, G. W., Buffalo, N. Y. .... Mch. 12, '69  
 Cochran, Miss Abbie, Monterey, Mexico. .... Feb. 28, '79  
 Coffeen, Miss Olive E., Minneapolis, Minn. .... Feb. 25, '87  
 Collett, Prof. O. W., St. Louis, Missouri. .... Apr. 27, '83  
 Comstock, Prof. J. Henry, Washington, D. C. .... June 24, '81  
 Comstock, T. B., Ithaca, N. Y. .... Apr. 27, '77  
 Condon, Prof. C., Portland, Or. .... Nov. 5, '80  
 Conrad, T. A., Philadelphia, Pa. .... Apr. 27, '77  
 Cook, Prof. A. J., Lansing, Mich. .... Dec. 31, '80  
 Cook, Prof. G. H., New Brunswick, New Jersey. .... June 28, '78  
 Cope, E. D., Philadelphia, Pa. .... Apr. 27, '77  
 Coues, Dr. E., Washington, D.C. .... Apr. 27, '77  
 Coulter, J. M., Hanover, Ind. .... Apr. 27, '77  
 Cowan, Frank, Greensburg, Pa. .... Oct. 31, '79  
 Cox, E. T., Indianapolis, Ind. .... Apr. 27, '77  
 Cox, L. A., — — — — — Aug. 26, '87  
 Crampton, C. A., Moline, Ill. .... Apr. 25, '79  
 Crapnell, W., New Boston, Ill. .... Dec. 14, '67  
 Crawford, H. D., Ottumwa, Ia. .... Aug. 31, '83  
 Cresson, E. T., Philadelphia, Pa. .... July 28, '76  
 Crooke, J. J., New York City. .... Apr. 27, '77  
 Culver, L. M., Waukegan, Wis. .... Nov. 5, '80  
 Cummings, Isaac, — — — — — Feb. 22, '68  
 Dall, W. H., Washington, D.C. .... Apr. 27, '77  
 Dalrymple, Rev. E. A., Baltimore, Maryland. .... Apr. 27, '77  
 Dana, Prof. J. D., New Haven, Connecticut. .... Apr. 27, '77  
 Davis, W., Iowa City, Ia. .... May 25, '83  
 De Hart, Dr. J. N., Whippoor, New Jersey. .... Oct. 31, '79  
 Demarest, Rev. M., Pena Blanca, New Mexico. .... Sept. 24, '97  
 De Saussure, Henri, Geneva, Switzerland. .... Apr. 25, '79  
 Dial, Joshua, Senatobia, Miss. .... Jan. 4, '68  
 Dickey, S. H., Fulton, Ill. .... Dec. 14, '67  
 Dimmick, Dr. L. N., Santa Barbara, Cal. .... Dec. 29, '76  
 Dodge, C. R., Washington, D.C. .... Apr. 27, '77  
 Doerflinger, C., Milwaukee, Wis. .... Oct. 29, '86  
 Drake, Dr. S. H., West Union, Ia. .... Sept. 26, '79  
 Duges, Eugene, Silao, Guanajuato, Mexico. .... Mch. 28, '79  
 Eads, A. D., Champaign, Ill. .... Jan. 4, '68  
 Eads, Rev. R. S., Bolton, Mass. .... Jan. 4, '68  
 Edwards, Henry, Boston, Mass. .... July 28, '70  
 Edwards, W. H., Coalburg, West Virginia. .... Apr. 27, '77  
 Egan, W. C., Chicago, Ill. .... Sept. 24, '80  
 Eliot, Rev. T. L., Portland, Or. .... Nov. 5, '80  
 Emerton, J. H., Salem, Mass. .... Apr. 27, '77  
 Englemann, Dr. Geo., St. Louis. .... July 28, '76  
 Englemann, Dr. G. J., St. Louis. .... Apr. 27, '77  
 Espinoza y Cervantes, Antonio, San Luis Potosi, Mex. .... Mch. 29, '78  
 Farlow, Prof. W. G., Boston. .... Apr. 27, '77  
 Farnier, Prof. P., Paris, France. .... Dec. 29, '82  
 Farnsworth, Dr. P. J., Clinton, Ia. .... Sept. 24, '86  
 Faught, V. R., Hamilton, Ill. .... Dec. 14, '67  
 Fitch, Dr. Asa, Salem, N. Y. .... July 27, '77  
 Field, Burr R., Baltimore, Md. ....  
 Firor, V. M., Charlestown, W. Va. .... Nov. 28, '78  
 Flagler, Gen. D. W., Wash., D.C. .... Apr. 25, '70  
 Foreman, Dr. E., Wash'n, D.C. .... Apr. 27, '77  
 Forbes, S. A., Normal, Ill. .... Apr. 27, '77  
 Fresenius, Dr. C. R., Wiesbaden, Germany. .... Dec. 29, '82  
 Gardner, Jas. T., Albany, N. Y. .... Apr. 27, '77  
 Gentry, T. G., Germantown, Pa. .... Apr. 27, '77  
 Gilchrist, Miss Belle M., Des Moines, Ia. .... Sept. 24, '86  
 Gill, Theo. H., Washington, D.C. .... June 29, '77  
 Glaspell, Chas., Kansas City, Mo. .... Sept. 4, '68  
 Glover, Townsend, Wash'n, D.C. .... June 29, '77  
 Goodale, Prof. George L., Cambridge, Mass. .... Apr. 27, '77  
 Goss, B. F., Pewaukee, Wis. .... Oct. 29, '86  
 Graham, Mrs. Lizzie Allen, Davenport, Ia. .... Feb. 12, '69  
 Grant, Dr. H. M., Helena, Ark. .... May 25, '83  
 Greene, Rev. E. L., Denver, Col. .... Apr. 27, '77  
 Greenlee, W. F., Belle Plain, Ia. .... June 29, '88  
 Gregory, Prof. J. M., Champaign, Illinois. .... July 27, '77  
 Griffith, Lieut. J. E., U. S. Lake Survey. .... Mch. 20, '68  
 Grote, Prof. A. R., New Brighton, New York. .... Dec. 31, '80  
 Gunning, W. D., Boston, Mass. .... Apr. 27, '77  
 Gunther, Otto, Worcester, Mass. .... Jan. 25, '78  
 Gurney, James, St. Louis, Mo. .... Oct. 29, '86  
 Guyot, Prof. A., Princeton, N. J. .... Apr. 27, '77  
 Hagen, Dr. Herman A., Cambridge, Mass. .... July 28, '76

\*Haines, Mrs. Mary P., Richmond, Indiana ..... May 29, '74

\*Hall, Prof. Jas., Albany, N.Y. Apr. 27, '77

Hall, M. S., Wilmington, Illinois.  
(transferred). ..... Jan. 25, '68

Harford, W. G. W., San Fr., Cal. July 28, '76

Harkness, Dr. H. W., San Francisco, Cal. ..... Apr. 27, '77

Harris, D. H., Cuba, Ill. ..... Mch. 26, '86

Hasselquist, Prof. L. R., Rock Island, Ill. ..... Nov. 30, '83

Hawkins, B. W., Phila., Pa. ..... Apr. 27, '77

Haworth, Prof. Erasmus, Oskaloosa, Ia. ..... Dec. 26, '95

Hayden, Dr. F. V., Wash., D. C. Apr. 27, '77

Hennings, E. J., Pewaukee, Wis. Oct. 29, '86

Henderson, L. F., Portland, Or. Nov. 5, '80

Herrera, Alfonso, City of Mex. Mch. 29, '78

Higday, Dr. T., La Porte, Ind. Dec. 14, '67

Hilder, F. F., St. Louis, Mo. ..... Apr. 27, '83

Hinrichs, Prof. Gustavus, Iowa City, Ia. (transferred). ..... Jan. 25, '68

Hiskey, W. O., Minneap., Minn. Jan. 4, '68

Hoerring, G. P., Iowa City, Ia. Feb. 25, '87

Hoffman, Dr. W. J., Washington, D. C. ..... Mch. 28, '79

Holbrook, W. C., Coleta, Ill. ..... Mar. 28, '70

Holden, Wm., Marietta, O. ..... Apr. 27, '77

Holmes, W. H., Wash'n, D. C. Oct. 26, '83

Horn, Dr. Geo. H., Phila., Pa. ..... Apr. 27, '77

Hoy, Dr. R. R., Racine, Wis. Aug. 31, '88

Hyatt, Prof. Alpheus, Boston. Apr. 27, '77

Iles, Malvern W., Denver, Col. Apr. 27, '77

Ingersoll, Ernest, Jers. City, N.J. Apr. 27, '77

Johnson, Dr. H. A., Chicago, Ill. July 28, '76

Johnson, O. B., Salem, Or. ..... Nov. 5, '80

Jones, Dr. Jos., New Orleans, La. Apr. 27, '77

Jones, Thos. J., Coal Valley, Ill. Dec. 14, '67

Jones, Capt. Wm. A., Charleston, South Carolina. ..... Apr. 27, '77

Kellogg, Dr. A., San Fran, Cal. July 28, '79

Kellogg, Dr. C. F., Charlotte, Ia. Jan. 28, '81

Kenicott, Dr. Robert, Chicago, Ill. (transferred). ..... Jan. 25, '68

Kiel, J. B., Montrose, Ia. ..... Nov. 26, '80

King, Clarence, Wash'n, D. C. Apr. 25, '79

King, Rev. J. D., Edgartown, Mass. ..... June 27, '79

Kirby, Mrs. Julia D., Jacksonville, Illinois. ..... Oct. 26, '77

Kock, Dr. L., Nuremberg, Bav. Nov. 28, '78

Landreau, S. L., Paris, France. Mch. 25, '98

Landry, Dr. S. F., Galvest'n, Ind. May 28, '86

Lapham, Dr. I. A., Milwaukee, Wis. (transferred). ..... Feb. 1, '68

Latham, Mrs. R. E., Lincoln, Ill. Sept. 24, '80

Lathrop, D., La Salle, Ill. ..... Dec. 14, '67

Lea, Dr. Isaac, Philadelphia, Pa. Apr. 7, '77

Lee, Milo, Rock Island, Ill. ..... Jan. 25, '98

Leggitt, W. H., New York City. Apr. 7, '77

Leidy, Jos., Philadelphia, Pa. ..... Apr. 27, '77

Lemon, J. G., Sierra Val'y, Cal. Dec. 29, '79

\*Lesquereux, Leo, Columbus, O. Apr. 27, '77

Leveritt, Frank, Denmark, Ia. May 28, '86

Lewis, H. W., Davenport, Iowa, (transferred). ..... Dec. 29, '82

Lighton, Thos., Rock Island, Ill. Jan. 25, '68

Lindahl, Prof. J., Rock Isl'd, Ill. Oct. 31, '79

Lingle, David, Rock Island, Ill. Jan. 25, '68

Lintner, J. A., Albany, N.Y. ..... Apr. 27, '77

Longpre, L. J., Ontonagon, Mich. Oct. 31, '79

MacLean, Rev. J. P. ..... July 30, '86

Macomber, Prof. J. R., Ames, Ia. June 24, '81

Mahoney, J. A., Ramelton, Ire. Dec. 20, '82

Mann, B. P., Cambridge, Mass. Apr. 27, '77

Mark, Dr. E. L., C'mb ge, Mass. Nov. 28, '78

\*Marsh, Prof. O. C., New Haven, Conn. ..... Apr. 27, '77

Mason, L. G., Oregon, Ill. ..... May 27, '87

Mason, O. T., Washington, D.C. Apr. 27, '77

\*May, Enoch, Burlington, Ia. Dec. 14, '67

McCarn, Miss C., Anamosa, Ia. Feb. 23, '83

McCook, Rev. H. C., Phila., Pa. Apr. 27, '77

McCowen, Miss S., Engle'wd, Ill. Nov. 27, '86

McGee, W. J., Farley, Ia. ..... June 24, '81

McMeehan, Miss E., Camanche, Iowa. ..... Dec. 29, '82

McNeill, Prof. Jerome, Fayetteville, Ark. ..... Dec. 27, '95

McWhorter, Tyler, Aledo, Ill. June 24, '81

Mead, Theo. L., New York City. Apr. 27, '77

Meehan, T., Philadelphia, Pa. Apr. 27, '77

Mendoza, Gumesindo, Museo Nacional, Mexico. ..... Mch. 29, '78

Merriman, Mrs. Dwight, Jackson, Mich. ..... Jan. 25, '78

Miles, Joshua J., Clinton, Ill. ..... Jan. 4, '68

\*Miller, S. A., Cincinnati, O. ..... Dec. 28, '77

Milligan, Mrs. J. M., Jacksonville, Illinois. ..... Dec. 28, '77

Moore, W. B., San Antonio, Tex. Jan. 4, '68

Morgan, L. H., Rochester, N.Y. Apr. 27, '77

Morris Rev. J.G., Baltimore, Md. Apr. 27, '77

Morse, Edw. S., Salem, Mass. June 29, '77

Mueller, A. L., Sioux City, Ia. Nov. 28, '84

Muench, Fr., ——, Mo. ..... Jan. 25, '68

Nadaillac, Marquis de, Paris, Fr. June 26, '85

Newbury, Prof. J. S., N. Y. City. Jan. 30, '74

Newcomb, Dr. W., Ithaca, N.Y. Apr. 27, '77

\*Nipher, Prof. F. E., St. Louis. July 27, '77

Nissen, Theo., Davenport, Ia. ..... Jan. 4, '68

Norton, E., Farmington, Conn. June 29, '77

Olmstead, Prof. L. G., Fort Edward, N.Y. ..... Oct. 26, '77

Olney, S. T., Providence, R.I. Apr. 27, '77

Orcott, Mrs. C. R., San Diego, Cal. ..... Aug. 25, '82

Orr, Ellis, Postville, Ia. ..... Oct. 26, '83

Osborn, Prof. H., Ames, Ia.... Aug. 25, '82  
 Osten Sacken, Baron C. R., Heidelberg, Germany.... Sept. 28, '76  
 Packard, Dr. A. S., Jr., Salem, Mass.... Apr. 27, '77  
 Palmer, Dr. E., Camb'dge, Mass. Dec. 29, '76  
 Parker, Prof. H. W., Ames, Iowa, (transferred).... May 1, '68  
 Parker, N. H., St. Louis, Mo.... Mch. 14, '68  
 Patterson, H. N., Oquawka, Ill.... Apr. 25, '79  
 Paul, Dr. John, Ottawa, Ill.... Mch. 12, '69  
 Peabody, Prof. S. H., Chicago.... July 28, '76  
 Peckham, G. W., Milwaukee.... Jan. 25, '84  
 Pelt, Rev. S. D., Unionville, O.... Apr. 27, '77  
 Perry, Mrs. C. H., Keokuk, Ia.... Sept. 24, '80  
 Philippi, Dr. R. A., Santiago, Ch. Nov. 28, '78  
 Piernas, Dr. J. A., San Luis Potosi, Mexico.... Mch. 29, '78  
 Pooler, F. S., Albany, Ill.... Oct. 31, '70  
 Porter, Miss Mary, Pekin, China. Nov. 5, '80  
 Porter, Thomas C., Easton, Pa.... Apr. 27, '77  
 Powell, Prof. J. W., Urbana, Ill. Mch. 21, '68  
 Poynter, Robert, Poynter, Ark. Sept. 26, '84  
 Proudfit, S. V., Glenwood, Ia.... Apr. 29, '81  
 Putnam, F. W., Cambr'ge, Mass.... July 28, '76  
 Rathvon, Dr. S. S., Lancaster, Pa. Oct. 31, '79  
 Rau, Dr. Chas., Wash'n, D. C.... Apr. 27, '77  
 Redfield, J. H., Philadelphia, Pa. Apr. 27, '77  
 Reilly, Albert, Davenport, Ia.... Apr. 27, '77  
 Reppert, Fred., Muscatine, Ia.... Apr. 27, '77  
 Ridgway, Robert, Wash'n, D. C. Apr. 27, '77  
 \*Riley, Chas. V., Wash'n, D. C.... Dec. 14, '67  
 \*Rodman, Gen. T. J., Rock Island Arsenal.... Dec. 14, '67  
 Roe, Dr. E. R., Bloomington, Ill. Dec. 14, '67  
 Sanchez, Jesus, Museo Nacional, Mexico.... Mch. 29, '78  
 Sanders, Mrs. M. A., Davenport, Iowa (transferred).... Jan. 4, '68  
 Saunders, Wm., London, Ont.... Apr. 27, '77  
 Schmidt, Dr. Emil, Essen, Prus. Jan. 31, '79  
 Scudder, S. H., Cambr'ge, Mass. Apr. 27, '77  
 Sedbury, Dr. W. R., Detroit, Mich. Apr. 25, '90  
 Seve, Edw., N. Y. City (trans'd).... Jan. 4, '68  
 Seyffarth, Dr. G., N. Y. City.... Apr. 25, '79  
 Shaler, Prof. N. S., Cambridge, Mass.... Apr. 27, '77  
 Shaw, Jaines, Mt. Carroll, Ill.... June 25, '80  
 Shepard, C. U., Amherst, Mass. Mch. 26, '80  
 Shepard, C. U., Jr., Charleston, South Carolina.... Mch., 26, '80  
 Shimek, Prof. B., Iowa City, Ia.... Apr. 26, '80  
 Shimer, Dr. H., Mt. Carroll, Ill.... June 25, '80  
 Shipp, Dr., Shipp's Land'g, Tenn. Jan. 29, '80  
 Shroyer, J. E., Cincinnati, O.... Apr. 27, '77  
 Signoret, Dr. V., Paris, France.... Nov. 28, '78  
 Siliroato, Pietro Bernabo, Rome, Italy.... Nov. 28, '86  
 Simon, Eugene, Paris, France.... May 30, '70  
 Simpson, C. T., Ogalalla, Neb.... July 30, '86  
 Smith, Miss Emily A., Peoria, Ill. July 27, '77  
 Smith, Miss Rose, San Diego, Cal. Oct. 26, '83  
 Smith, S. I., New Haven, Conn.... Apr. 27, '77  
 Snow, Prof. F. H., Lawrence, Kan. Apr. 27, '77  
 Somers, W. D., Urbana, Ill.... Jan. 4, '68  
 Starr, Prof. F., Cedar Rapids, Ia. Aug. 27, '86  
 Stearns, R. E. C., Berkely, Cal.... Apr. 27, '77  
 Steiniger, Oscar, Bellevue, Ia.... Aug. 31, '77  
 Stennett, Dr. W. H., Bloomington, Illinois.... Aug. 7, '68  
 Sterling, Dr. E., Cleveland, O.... June 29, '77  
 Stewart, J. R., Toledo, Ia.... Jan. 25, '68  
 Stillman, Dr. J. D. B., San Francisco, Cal.... Dec. 29, '76  
 Strecker, Herman, Reading, Pa. July 28, '76  
 Stretch, R. H., San Fran., Cal.... July 28, '76  
 Suksdorf, H. F., Portland, Or.... Nov. 5, '80  
 Sukstdorf, William, White Salmon, W. T.... Nov. 5, '80  
 Summers, W. D., Urbana, Ill.... Jan. 4, '68  
 Swiney, Dan'l, Ramelton, Irel'd. Dec. 31, '80  
 Tandy, M., Dallas City, Ill.... Dec. 28, '77  
 Tanner, Frank B., Dubuque, Ia.... Jan. 4, '68  
 \*Tenney, Prof. Sanborn, Williams-town, Mass.... Apr. 27, '77  
 Thomas, Dr. C., Carbondale, Ill. July 28, '76  
 Thomas, Prof., Portland, Or.... Nov. 5, '80  
 Thomson, Rev. H. C., Monterey, Mexico.... Feb. 28, '79  
 Thorell, Prof. T., Upsala, Swd'n. Nov. 28, '78  
 Thurber, Geo., New York City.... Apr. 27, '77  
 Toellner, A., Milwaukee, Wis.... Mch. 26, '80  
 Telmie, Dr. W. F., Victoria, B. C. Nov. 5, '80  
 Torrel, Prof. O., Stockholm, Sw. July 27, '77  
 \*Torrey, Dr. Ino., N. Y. City.... Mch. 12, '60  
 Tracy, Prof. S. M., Columbia, Mo. Aug. 27, '86  
 Treat, Mrs. Mary, Vineland, N. J. June 29, '77  
 Trimen, Prof. Rojand, Cape Town, Africa.... Mch. 28, '79  
 \*Tryon, G. W., Philadelphia, Pa. Apr. 27, '77  
 Udden, Prof. J. A., Rock Isl., Ill. Jan. 25, '89  
 Uhler, Philip R., Baltimore, Md. Apr. 27, '77  
 Ulke, Henry, Wash'n, D. C.... July 28, '76  
 Vasey, Dr. Geo., Wash'n, D. C.... Apr. 27, '77  
 Velic, Dr. J. W., Chicago, Ill.... July 28, '76  
 Verrill, A. E., New Haven, Conn. Apr. 27, '77  
 Villada, Manuel M., —, Mex.... Mch. 29, '78  
 Vining, E. P., Omaha, Neb.... May 25, '83  
 \*Wachsmuth, Prof. Charles, Burlington, Iowa.... Mch. 28, '79  
 Waldron, Dr. C. F., Brush Creek, Iowa.... Dec. 28, '78  
 Waller, B. F., New Palestine, Mo. Sept. 24, '86  
 \*Walsh, Benj. D., Rock Isl'd, Ill. Dec. 14, '67  
 Walton, Miss Alice B., Muscatine, Iowa.... Jan. 25, '78  
 Ward, Prof. H. A., Rochester, New York.... Dec. 28, '78

Watson, Sereno, Camb'ge, Mass.	Apr. 27, '77	Winchell, Prof. Alexander, Syracuse, N. Y.	June 29, '77
Watson, Warren, Kan. City, Mo.	Apr. 25, '90	Winchell, Prof. N. H., Minneapolis, Minn.	Apr. 25, '79
Wellington, W. E., Dubuque, Ia.	Jan. 25, '68	Winslow, Dr. —, Peru, Ill.	
Wheeler, Lieut. G. H., Washington, D. C.	Apr. 25, '79	Wirt, Miss Julia J., Payson, Utah.	Nov. 23, '76
White, A. D., Ithaca, N. Y.	June 29, '77	Wislizenus, Dr. A., St. Louis, Mo.	Mch. 12, '69
White, Dr. C. A., Iowa City, Ia.	Dec. 14, '67	Witter, Prof. F. M., Muscatine, Iowa.	Apr. 30, '86
Whitfield, R. P., Albany, N. Y.	Apr. 27, '77	Wolf, John, Canton, Ill.	July 28, '76
Whitney, Prof. J. D., Cambridge, Mass.	Apr. 27, '77	Woodman, H. T., Dubuque, Ia.	Apr. 27, '77
Whitney, Prof. W. D., Baltimore, Md.	Apr. 27, '78	Woodruff, Prof. L. D., San Diego, Cal.	Nov. 30, '83
Whittlesey, Col. Charles, Cleveland, O.	Apr. 27, '77	Worthen, Prof. A. H., Springfield, Ill.	Dec. 14, '67
Wickham, Prof. H. F., Iowa City, Iowa	Dec. 27, '95	Wright, W. G., San Bernardino, Cal.	Dec. 29, '76
Wilcox, Dr. H. B., Three Oaks, Mich. (transferred)	May 1, '68	Young, H. C., Glasgow, Scotl'd.	Oct. 31, '79
Wilder, Prof. B. G., Ithaca, N. Y.	Apr. 27, '77	Young, Rev. Thomas L., —	Aug. 26, '87
Wilson, Judge W. W., Lebanon, O.	Oct. 27, '82		

## REGULAR MEMBERS.

RESIDENCE, DAVENPORT, UNLESS OTHERWISE STATED.

\*Deceased.

Abel, H., Jr.	Dec. 31, 1886	Barrette, Miss Lydia O.	July 30, 1875
Adams, Capt. A. E.		Barris, Prof. W. H.	Dec. 14, 1867
Adams, Claude E.	May 29, 1896	Bean, J. L.	Jan. 18, 1868
*Adams, Walker	Aug. 31, 1877	Bechtel, George M.	May 31, 1898
Adams, Mrs. Walker.	July 28, 1876	Becker, Gustav.	June 29, 1883
Albrecht, Otto.		Behr, Dr. A.	Feb. 23, 1894
Allen, Joseph.	Feb. 25, 1877	Beiderbecke, Charles.	Dec. 28, 1877
*Allen, Col. William.	Oct. 31, 1873	Bernis, Fred P.	Apr. 26, 1895
*Allen, Mrs. Col. William.	July 30, 1875	Benson, H. H.	Feb. 28, 1873
Allen, Dr. W. L.	June 29, 1877	*Berryhill, J. H.	Oct. 30, 1874
Anderson, Rev. S. MacA.	Oct. 9, 1868	Berwald, John.	July 27, 1877
Andresen, H. H.	Jan. 28, 1881	Best, L. P.	Feb. —, 1893
Andresen, Richard.	Mch. 31, 1899	*Bills, Hon. J. C., Apr. 30, 1875, Jan. 8, 1892	
Andrews, Major —	Apr. 25, 1873	Bills, Mrs. John C.	Dec. 31, 1875
Ansley, Clark F., Swedona, Ill.	Aug. 25, 1882	Bissell, W. P.	May 25, 1883
Atkinson, B.	Nov. 13, 1868	Blackmon, P. S.	Mch. 30, 1877
Babcock, D. D.	Dec. 11, 1868	Block, Louis.	Feb. 27, 1801
Babcock, E. J.	May 5, 1876	Blumer, Rev. A.	June 25, 1880
*Bahl, John.	Sept. 2, 1877	Bollinger, J. W.	Feb. 25, 1887
Baker, Dr. C. R.	Sept. 11, 1895	Bollinger, A. L.	Jan. 25, 1884
Baker, Mrs. Fred.	Oct. 29, 1875	Borcherdt, Edward.	Feb. 23, 1894
Baker, George T.	Apr. 28, 1893	Bowman, Dr. A. W.	Dec. 31, 1886
Baker, Dr. J. W. H.	May 25, 1883	Bowman, J. R.	Oct. 30, 1874
*Baker, Dr. R. F.	Jan. 11, 1869	Boynton, E. W.	Dec. 27, 1895
Balch, F. A.	May 28, 1875	Brewster, W. C.	Apr. 25, 1873
Ballard, John W.	June 29, 1883	Brewster, Mrs. W. C.	Dec. 17, 1877
Ballard, Miss Bessie.	Mch. 31, 1899	Bronson, C. E.	Jan. 28, 1876
Ballard, E. S.	Feb. 26, 1875	*Brownson, William H.	Sept. 27, 1889
*Ballou, George H.	July 30, 1875	Brown, C. J.	Feb. 27, 1880
Ballou, Mrs. Geo. H.	July 30, 1875	Brown, L. B.	June 25, 1875
Bardwell, Dr. Eugene O.	Jan. 25, 1884	Brown, Manly T.	Nov. 26, 1875
Barker, George J.	May 25, 1883	Brown, Mrs. Mary E.	Apr. 25, 1879
*Barler, A. U.	Founder	*Brown, S. E.	June 25, 1875

Bryant, Seth P.	Oct. 9, 1868	Dart, Henry, R. Isl'd, Ill	Oct. 28, 1881
Bryant, Mrs. Seth P.		Davies, J. Meredith	Aug. 31, 1877
Buffum, Rennah	Oct. 30, 1874	*Davies, John L.	Jan. 25, 1868
Bunker, Andrew	Feb. 25, 1870	Davies, Mrs. John L.	Aug. 27, 1875
Bunker, M.	Oct. 24, 1895	Davies, L. S.	Feb. 28, 1874
*Burchill, Robert	June 29, 1883	Davies, Mrs. L. S.	Sept. 2, 1877
Burdick, A.	Oct. 26, 1877	Davis, F. O., Dec. 28, 1877	Aug. 25, 1882
Burdick, Mrs. A.	Oct. 26, 1877	Davison, Charles	Aug. 31, 1877
Burr, Charles P.	May 30, 1873	Davison, Miss Ella	Aug. 31, 1877
Bushnell, H. T.	Feb. 28, 1879	Dawson, Miss Rose	April 27, 1877
Cable, George W.	Oct. 31, 1884	Day, E. A.	Feb. 28, 1868
Cable, George W., Jr.	Mar. 31, 1890	Daymude, J. L.	
Calderwood, M. H., Eldridge, Iowa	July 30, 1886	*D'Armond, J. M.	March, 28, 1873
Call, Prof. R. E., Moline, Ill.	Nov. 27, 1885	Decker, Hal	Oct. 29, 1886
Campbell, W. P.	Feb. 8, 1868	Dennis, Dr. A. B.	Aug. 27, 1886
Candee, F. A., Moline, Ill.	Jan. 31, 1879	*Dermody, J. L.	Jan. 25, 1868
Carl, E. S.	Oct. 31, 1884	Doe, Gilman	Feb. 27, 1880
Carleton, Frank	June 29, 1883	Donahue, James	
Carmichael, Henry	Oct. 31, 1879	*Donahue, Michael	Feb. 29, 1868
Carmichael, Joseph E.	March 31, 1876	Donaldson, Dr. John B.	June 25, 1898
Carstens, Gustav	May 26, 1876	*Dosh, J. P.	June 25, 1875
Cassell Dr. M. H.	June 29, 1883	Dow, Geo. S. C.	March 21, 1868
Cassell, Mrs. M. H.	June 29, 1883	*Dow, T. T.	Nov. 30, 1877
Challen, Rev. James	Dec. 11, 1868	Durfee, C. S.	May 25, 1883
Chapin, Miss —	Oct. 28, 1868	Eads, Luther T.	Founder
Chapin, E. C.	Feb. 25, 1876	*Edwards, Frank	March 3, 1882
Chapin, Mrs. E. C.	Feb. 25, 1876	Egbert, Col. Henry	May 25, 1883
*Churchill, Dr. A. D.		*Eldridge, C. H.	April 3, 1868
Clarke, E. A.	April 27, 1877	*Ells, C. S.	Dec. 14, 1867
*Claussen, H. R.	Jan. 25, 1878	Elmer, Dr. A. W.	Feb. 27, 1891
Claussen, William	May 25, 1883	Emeis, H. A.	June 29, 1883
Clemmer, C. H.	April 30, 1875	Evans, John	Feb. 12, 1869
Clevenger, J. J.	June 29, 1883	Evans, Joseph	Dec. 31, 1886
*Cochran, Dr. M. B.	March 12, 1869	Falk, Theo	June 29, 1883
Cochran, Mrs. M. B.	June 25, 1875	*Farquharson, Dr. R. J.	Dec. 11, 1868
Collins, Miles A.	Feb. 8, 1868	*Fejervary, Mrs. Karoline	Sept. 28, 1877
Conner, Mrs. H. M.	Nov. 5, 1880	Ficke C. A.	Jan. 25, 1878
Conner, J. S.	Oct. 9, 1868	Ficke, Mrs. C. A.	Feb. 29, 1896
*Cook, Mrs. Clarissa C.	Jan. 28, 1876	Fidlar, Frank	Jan. 29, 1897
Cook, E. E.	May 25, 1883	Fidlar, W. F.	May 25, 1883
*Cook, Judge William	June 30, 1876	Fisher, J. B.	May 28, 1875
Copeland, George E.	Aug. 27, 1886	Fisher, Mrs. M.	Jan. 28, 1876
*Crandall, J. A.	Feb. 25, 1875	Fisher S. A.	
Crawford, John N.	Oct. 2, 1868	Fitch, G. W.	Nov. 26, 1875
*Crawford, Joseph A.	May 29, 1874	Fitch, Mrs. G. W.	March 31, 1876
Crawford, Mrs. Joseph A.	July 30, 1875	Flemming, J. R.	May 25, 1883
Crawford, Dr. J. P., May 25, '83	Dec. 27, '95	Fletcher, D. A.	April 27, 1877
Crosby, Prof. W. E.	Jan. 27, 1871	Fluke, W. H.	May 25, 1883
Crossett, Edward Clarke	March 31, 1899	*Frahm, Henry	April 25, 1878
Crossett, E. S.		Francis, Charles	May 29, 1896
Crossett, Mrs. E. S.		Freeman, J. A.	Nov. 26, 1875
*Curry, Mrs. T. F. M.	May 5, 1876	French, C. A.	
Cutter, A. F.	May 25, 1883	*French, George H.	Aug. 7, 1868
Dahm, C. T.	June 25, 1880	French, Mrs. Geo. H.	July 30, 1875
*Dahms, John J.	May 28, 1886	French, Geo. W.	July 30, '75, Mar. 30, '83
Dalzell, Henry	July 30, 1875	French, Mrs. Geo. W., (Miss Clara Decker)	May 25, 1888
Daniel, Dr. Joseph A.	April 20, 1895	French, Dr. L.	Dec. 11, 1868
Darlington, Howard	Oct. 9, 1808	French, Nathaniel	May 25, 1883

*French, Robert T.	Oct. 31, 1884	Hill, Charles	.....	
Fulton, Harry C.	Dec. 31, 1875	Hill, John	.....	May 25, 1883
Gannon, M. V.	March 30, 1877	*Hill, R. B.	.....	Dec. 30, 1870
Garrett, D. C.	June 29, 1883	Hinrichs, G. H.	.....	Jan. 26, 1883
Garstang, Frank W.	Feb. 26, 1807	Höpfner, Dr. G.	.....	July 30, 1886
Gartside, B. W.	Dec. 28, 1877	Holmes, Miss Clara M.	.....	1875
Gass, Rev. J.	May 28, 1875	*Holmes, Wm. H.	.....	Feb. 8, 1868
Geisler, Emil	Oct. 31, 1879, Feb. 29, 1806	Hoover, Rev. Geo. K.	.....	Jan. 30, 1891
*George, John	Oct. 27, 1882	Hopkins, E. P.	.....	Jan. 28, 1876
*Gifford, Ira M.	Feb. 29, 1868	*Howard, Mrs. Nettie F.	.....	Jan. 28, 1897
Gifford, Mrs. Ira M.	July 30, 1875	Howe, T. H., Pittsburgh, Pa.	Mch. 30, 77	
Gilman, S. F.	Jan. 29, 1875	Hoyt, John	.....	June 29, 1883
Glass, C. D.	Jan. 29, 1875	Hubbell, Charles H.	.....	Oct. 28, 1881
*Glimm, Benjamin	March 31, 1882	Huebinger, Adam	.....	Dec. 31, 1886
Goldsbury, Jay	Oct. 27, 1876	Huebinger, Melchior	.....	Dec. 31, 1886
Goos, William	Aug. 31, 1883	Hume, John	.....	Jan. 4, 1868
Gould, Miss Ellen	.....	*Hume, Mrs. John	.....	Jan. 25, 1875
Grant, Gough B.	May 26, 1883	Humphrey, Levi	.....	Nov. 26, 1875
Grant, Mrs. James	.....	Humphrey, Mrs. J. J.	.....	April 27, 1877
Grant, Dr. W. W.	May 25, 1883	*Hunting, Rev. S. S.	.....	May 29, 2874
Gray, William	Oct. 9, 1808	Hunting, Mrs. S. S.	.....	June 25, 1875
Green, Wesley	Jan. 1892	Huntington, Mrs. H. B.	.....	Aug. 27, 1875
Grier, John N.	Feb. 25, 1887	*Iles, Dr. T. J.	.....	Jan. 18, 1868
Griggs, F. H.	July 30, 1875	Iles, Thomas, Jr.	.....	Mar. 31, 1899
Gronen, W. O.	Dec. 28, 1877	Jaenicke, Dr. A.	.....	July 30, 1886
*Gronen, Mrs. Sophia C.	Nov. 5, 1880	Jappe, Thos. H.	.....	Aug. 27, 1886
Gudeman, Dr. Edward	Sept. 27, 1805	Jenckes, Rev. Joseph S.	.....	Jan. 26, 1877
Gwynn, Oscar J.	Nov. 29, 1889	Jenkins, Mrs. G. W.	.....	June 25, 1880
Haddix, E. P.	Jan. 11, 1869	*Jervis, Frank I.	.....	Feb. 25, 1876
Haddix, Miss Florance	Dec. 31, 1886	Jervis, Mrs. F. I.	.....	Feb. 25, 1876
Haddix, Miss Grace	Dec. 31, 1886	Jones, P. B.	.....	Oct. 2, 1868
Hall, Miss Grace	June 25, 1880	Judy, Rev. A. M.	.....	Nov. 24, 1882
*Hall, Israel	Nov. 23, 1876	Karwarth, Henry	.....	May 25, 1883
Hall, William C.	Jan. 11, 1869	Kelley, F. W.	.....	Jan. 29, 1875
Hall, Capt. W. P.	May 28, 1875	Kerker, George W	.....	
Hall, Mrs. W. P.	June 25, 1880	Kinsey, J. C.	.....	Jan. 28, 1881
Hammatt, Edward S.	April 29, 1892	Kirk, Franklin, Sr.	.....	Oct. 30, 1874
Hancock, F. H.	May 28, 1875	*Klug, Otto	.....	Mar. 29, 1878
Hanssen, Louis	Dec. 31, 1880	Knapp, M. M.	.....	June 28, 1884
Harrison, Charles E.	Oct. 29, 1875	Koch, Gustav	.....	Aug. 31, 1883
Harrison, Mrs. C. E.	March 2, 1888	Krabbenhoft, Geo.	.....	Dec. 31, 1886
Harrison, J. H.	Feb. 23, 1877, May 25, 1883	Krabbenhoft, Theo.	.....	Dec. 31, 1886
Hartley, James	Aug. 31, 1883	Kracke, Frank	.....	June 29, 1883
Hass, Detlef	Aug. - 1887	*Kramer, Geo. F.	.....	May 25, 1883
Hass, J. H.	Feb. 25, 1898	Krause, Robert	.....	Jan. 25, 1878
*Hastings, Frank S.	.....	Kruse, Conrad	Dec. 28, '77, Nov. 5, '80	
Hatch, Prof. W. H., Rock Isl- and, Illinois	Dec. 28, 1883	*Kuhnen, Nicholas	.....	Nov. 5, 1880
Hathaway A. D.	May 25, 1883	Kuhnen, N. V.	.....	Dec. 31, 1880
Haupt, J. G.	Nov. 27, 1874	*Kulp, Dr. W. O.	.....	June 20, 1883
Haverstick, Capt. L. M.	Nov. 28, 1873	Kurmeier, H.	.....	Nov. 5, 1880
Hazen, Dr. E. H.	Oct. 2, 1868	*Lambach, Henry	.....	Jan. 25, 1878
Hazen, Mrs. E. H.	June 25, 1875	*Lane, James T.	.....	Mch. 20, 1875
Heinz, Fred	Dec. 31, 1886	Lane, Mrs. James T.	.....	June 25, 1875
Hender, W.	May 25, 1883	Lardner, James F.	.....	Dec. 27, 1895
Hender, William H.	Dec. 27, 1892	Launsbury, Rev. A.	.....	Apr. 28, 1871
Henderson, H. H.	Oct. 28, 1869	Le Claire, Antoine J.	.....	June 28, 1878
Henley, H. M.	Aug. 31, 1883	Le Claire, Joseph A.	.....	July 30, 1875
Heywood, George S.	Jan. 30, 1874	Leonard, Miss Nellie	.....	March 31, 1899
		*Leonard, C. M.	.....	June 29, 1883

Lerch, A. J.	June 29, 1883	Miller, Rev. Emory	June 26, 1872
*Lerchen, Herman	Dec. 31, 1880	Miller, F. H.	Dec. 28, 1877
*Lesslie, Charles C.	Jan. 29, 1875	Milsted, Thos. G.	June 29, 1877
Lewis, H. W.	Nov. 5, 1880	*Miner, Dr. A. W.	June 29, 1883
Lighton, Thos., Rock Island, Illinois	July 30, 1869	*Miner, Mrs. Jennie True	Oct. 17, 1877
Lillibridge, D. R.	Jan. 7, 1880	Miner, Noyes B.	Jan. 7, 1880
Lillis, W. M., Aug. 27, 1861, Jan. 28, 1868		Morgan, Dr. J. B.	May 25, 1883
Lindley, Dr. Clarence T.	May 28, 1875	Morton, Allibone	Mch. 26, 1875
Lindsay, J. E.	June 25, 1884	Mossman, A. L.	Dec. 31, 1886
Lindsay, Mrs. J. E.	June 25, 1886	Mueller, Chris.	Dec. 28, 1877
Lischer, Henry		*Murphy, J. H.	Oct. 31, 1884
Lorenzen, Jens	Jan. 25, 1878	Murray, Thomas	June 29, 1883
Lowrey, Miss Alla P.	June 28, 1878	Myers, Miss Lizzie	Feb. 27, 1880
Ludlow, F.	May 25, 1883	*Myers, Dr. R. D.	Feb. 1, 1868
*Lumsden, J. A.	June 29, 1883	Nadler, Frank	Mch. 30, 1888
Lynch, E. P.	Dec. 11, 1868	Nagel, J. J.	Oct. 30, 1874
Lynch, W. A.	May 29, 1874	Newcomb, C. N.	Jan. 31, 1896
*Mandeville, Col. H. M.	Aug. 31, 1877	*Newcomb, Mrs. Patience V.	Oct. 29, '75
Mandeville, Mrs. H. M.	May 2, 1877	Nichol, Dr. Adella R.	Feb. 22, 1895
Mansel, Richard, Rock Island, Illinois	May 24, 1872	*Ochs, Francis	Jan. 25, 1878
Marix, Max	April 25, 1873	Oestlund, O. W.	Jan. 25, 1884
Marks, Mrs. M. L.	Mar. 26, 1886	*Oliver, E. A.	Apr. 25, 1879
Marsh, Mrs. H. C.	May 5, 1876	*Oliver, L. B.	Apr. 25, 1879
*Martin, Mrs. H. M.	Oct. 25, 1875	*Olshaussen, Dr. J. J.	Jan. 25, 1878
Martin, A. Vere	Feb. 26, 1867	Osborn, Robert P.	July 31, 1866
Mason, James B.	Feb. 26, 1875	Paine, L. B.	Dec. 21, 1868
Mason, John L.	May 25, 1883	*Parker, George H.	Feb. 25, 1876
Mast, C. A., June 29, 1883, Oct. 24, 1895		Parker, George W.	Sept. 28, 1876
Matthey, Dr. Carl	Jan. 18, 1890	*Parker, J. Monroe	Feb. 26, 1875
Matthey, Dr. H.	July 30, 1886	*Parker, Mrs. J. M.	Jan. 25, 1878
Maxwell, Dr. J. P.	Nov. 30, 1883	*Parrys, M. K.	May 25, 1883
McBride, Prof. T. H., Iowa City, Iowa	Dec., 1895	*Parry, Dr. C. C.	Dec. 14, 1867
*McClelland, George P.	1877	Parry, Mrs. C. C.	June 25, 1875
McClelland, Mrs. Geo. P.	Apr. 27, 1877	Parry, John E., Sandy Hill, New York	May 30, 1879
McClelland, Thos. W.	Aug. 31, 1877	Parry, Joseph, Jr.	Dec. 28, 1877
McClelland, Mrs. T. W.	Aug. 31, 1877	Parvin, Prof. T. S., Cedar Rap- ids, Iowa	Mch. 30, 1877
McClelland, Wilson	June 28, 1895	Paul, Dr. W. A., Rock Island, Illinois	Dec. 28, 1883
McCosh, J. K.		Paulsen, P. J.	
McCown, Dr. Jennie	March 3, 1882	Peck, Mrs. W. F.	Feb. 29, 1896
McCrumb, Miss A. J. S.	Dec. 28, 1883	*Pendleton, E. H., Cin'ti, O.	July 27, 1887
McCullough, W.	June 28, 1883	Pendleton, Mrs. E. H., Cincin- nati, O.	July 27, 1887
McGonegal, Mrs. M. A.	Nov. 26, 1875	*Perry, Rt. Rev. Wm. S.	Dec. 27, 1895
*McIntosh, Robert	Aug. 31, 1877	Pester, E.	Mch. 26, 1880
McNeill, Prof. Jerome, Moline, Illinois	Nov. 27, 1886	Petersen, J. H. C.	Jan. 27, 1882
McWhorter, T., Aledo, Ill.	Jan. 26, 1883	Petersen, L. W., Jr.	Oct. 7, 1887
Melville, J. H.	Oct. 9, 1868	Phelps, J. B.	Mch. 26, 1875
Merrill, J. E.	June 26, 1883	Phelps, Mrs. J. B.	Dec. 31, 1875
Merriman, Miss Nellie, Jack- son, Michigan	May 28, 1890	*Pickering, C. E.	Oct. 26, 1877
Middleton, Dr. W. D.	Feb. 28, 1874	Pierce, E. H.	Mch. 26, 1880
Middleton, Miss Mary	Oct. 29, 1875	Pierce, J. S.	Apr. 27, 1877
Miles, Andrew J.		Pilsbry, H. A.	Oct. 26, 1883
Millar, Rolfe S.	April 30, 1875	Plummer, Clarence	Nov. 30, 1883
Millar, Mrs. S. B. R.	June 25, 1875	Plummer, C. G.	Feb. 1, 1868
Miller, Alonza A.	April 30, 1898	Pomeroy, F. F.	Feb. 25, 1887
		*Potter, W. M.	Mch. 27, 74

Potter, Mrs. W. M.	July 30, 1875	Rowe, John	Oct. 29, 1875
Powers, C. J.	April 30, 1875	*Royce, H. F.	Dec. 26, 1885
Pratt, Chester L.	Jan. 28, 1876	Runge, Henry	Aug. 27, 1875
Pratt, Miss Frankie	Jan. 28, 1876	*Russell, Edward	Oct. 9, 1868
Pratt, Miss Lucy	June 25, 1875	Russell, Mrs. Edward	Feb. 25, 1876
*Pratt, W. H.	Founder	Ryan, E. H.	May 25, 1883
Pratt, Mrs. W. H.	Oct. 31, 1879	Sanders, E. B.	Nov. 27, 1886
Preston, Dr. C. H.	Oct. 31, 1873	Sanders, Miss Julia	Nov. 5, 1880
*Preston, W. C.	Feb. 25, 1887	Sanders, Mrs. M. A.	Oct. 29, 1875
Price, Hiram	Mch. 31, 1869	Sandham, John	...
Price, Reuben S.	Mch. 29, 1878	*Sands, M.	Nov. 27, 1874
Price, W. H.	July 26, 1872	Sanger, S. J.	Mch. 12, 1869
Priester, Charles	June 29, 1883	*Saunders, Dr. T. J.	Dec. 11, 1868
Putnam, Benj. R.	Aug. 28, 1865	Scharffenberg, H. G.	May 28, 1886
*Putnam, Charles E.	July 30, 1866	Schlegel, Dr. E.	Dec. 31, 1886
Putnam, Mrs. C. E. (Mary L. D.)	June 2, 1866	Schmidt, Charles	Mch. 30, 1877
Putnam, Charles M.	Jan. 26, 1877	Schmidt, F. T.	Oct. 31, 1879
Putnam, Edward K.	Nov. 24, 1882	Schmidt, W. O.	Feb. 29, '68, June 28, '78
Putnam, Miss Elizabeth D.	Oct. 29, 1875	Schroeder, Henry	...
Putnam, George R.	Dec. 25, 1877	Schumacher, Leo	May 25, 1877
Putnam, H. St. Claire.	Nov. 26, 1875	Seymour, J. S.	Aug. 7, 1868
*Putnam, John C.	Nov. 26, 1875	Sharon, T. L.	Dec. 31, 1886
*Putnam, Joseph Duncan	June 2, 1866	*Shand, Mrs. W. G.	Nov. 26, 1880
Putnam, W. Clement	May 5, 1876	Sheaff, Mrs. Isabella	Apr. 27, 1877
Radenshausen, Dr. P.	Oct. 27, 1882	*Sheldon, Prof. D. S.	Dec. 14, 1867
Raff, Miss Mary	Oct. 29, 1875	*Sheldon, Mrs. D. S.	June 25, 1875
Reed, Weller	Mar. 30, 1877	Sheriff, Charles E.	May 31, 1865
Reese, B. F.	Apr. 27, 1877	Sheldon, Miss Sarah Foote	Aug. 25, 1882
*Renwick, James	Feb. 26, 1868	Sherman, Mrs. W. B.	Feb. 25, 1876
Renwick, Miss Margaret	Jan. 28, 1868	Sickels, Robert	—, 1875
Renwick, Miss Rebecca	Jan. 28, 1868	Sickels, Mrs. Robert	Oct. 29, 1875
*Renwick, William	Mch. 4, 1868	Seiffert, H. O.	...
*Renwick, Mrs. William	July 30, 1875	Sieg, Miss Alice	Dec. 26, 1884
Renwick, Mrs. Ellen Godwin	Jan. 28, '81	Skinner, W. J.	Nov. 26, 1875
Renwick, Win. Godwin	Mch. 31, 1869	*Skinner, Mrs. W. J.	Nov. 26, 1875
Reupke, C.	June 29, 1883	*Smetham, Richard	Feb. 25, 1876
Rice, Miss Emma Adelia (Mrs. J. J. Richardson)	Sept. 11, 1865	*Smith, A. J.	Jan. 28, 1867
Richards, Clark	May 25, 1883	Smith, E. H.	June 29, 1877
*Richardson, D. N.	Feb. 25, 1876	Smith, Henry F.	Dec. 26, 1879
Richardson, Mrs. D. N.	Feb. 25, 1876	Smith, H. H.	Jan. 28, 1881
Richardson, J. J.	June 29, 1883	Smith, Hernian	Aug. 27, 1886
Richardson, M. N.	June 28, 1865	Smith, S. F.	Aug. 31, 1877
*Riepe, William	Dec. 14, 1867	Smith, Mrs. S. F.	Aug. 31, 1877
Roberts, Edward C.	Sept. 11, 1865	Smith, W. C.	May 25, 1883
Roberts, R. W.	Apr. 25, 1873	Smith, W. R.	Aug. 25, 1876
*Roberts, U. N.	Oct. 31, 1873	Smith, W. S.	Apr. 29, 1881
Roberts, Mrs. U. N.	Feb. 28, 1870	Snider, W. H.	June 29, '83, Jan. 25, 1889
Robinson, J. Frank, Rock Island, Illinois	Mch. 31, 1869	Southwell, J. H., Port Byron, Illinois	Oct. 27, 1876
Robinson, Capt. T. J.	Mch. 20, 1878	Spelletich, M.	Sept. 27, 1865
Roddewig, Paulo	Dec. 27, 1865	Spink, George H.	June 25, 1875
Rogers, Miss Harriet	July 30, 1875	*Spink, Henry	Dec. 25, 1874
Rohlf, M. J.	Mch. 31, 1876	Stanton, E. A.	Aug. 27, 1886
Rose, Roderick		Steffen, Herman	Dec. 31, 1886
Ross, W. F.	Mch. 12, 1866	*Stephenson, John	June 29, 1883
Rothschild, Isaac	July 27, 1877	Stephenson, W. J.	Feb. 22, 1868
*Roundy, Dr. D. C.	Mch. 21, 1868	*Stewart, Mrs. J. W.	Feb. 28, 1879
		*Stibolt, J. P.	Feb. 25, 1876

Stibolt, Mrs. J. P.	Feb. 25, 1876	*Vollmer, Emil	Dec. 31, 1886
Stoltzenau, H., Muscatine, Iowa	Oct. 28, '81	Vollmer, Henry, Feb. 25, '87, Aug. 27, '97	
Stricker, William	Dec. 31, 1886	Vollmer, Henry, Jr.	Apr. 31, 1899
Stuyvesant, M. L.	Nov. 26, 1875	Von Maur, C. J.	Jan. 28, 1897
Stuyvesant, Mrs. M. L.	Nov. 26, 1875	Wadsworth, Mrs. W. C.	June 25, 1875
Suksdorf, Carl F.	May 27, 1887	Walz, F. J.	Sept. 11, 1895
Sudlow, Miss P. W.	Oct. 20, 1875	*Warnebold, A.	Apr. 27, 1886
Swiney, Thomas O.	May 25, 1883	Warwick, Gordon	Jan. 11, 1869
Switz, John L.	Jan. 28, 1870	Washburn, Geo. J.	Dec. 27, 1895
Tabor, Ira R.	Oct. 24, 1805	Watkins, C. S.	Feb. 26, 1868
Taylor, Frank W.	May 30, 1879	*Wells, R. H.	Nov. 26, 1875
Techentin, H. W.	Feb. 25, 1887	Wheeler, H.	Feb. 1, 1868
Teese, J. S.	Feb. 12, 1869	Wheeler, Moses, Rock Island, Illinois	Sept. 27, 1889
Temple, John	Feb. 28, 1873	Whitaker, J. H., May 25, '83, Dec. 27, '95	
Thackeray, Dr. W. W.	Oct. 26, 1883	Whitaker, Miss Lottie Hall	Aug. 31, 1877
Thomas, B. F., Morn'g Sun, Ia.	May 27, '87	Whitcomb, E. H.	Apr. 30, 1898
Thompson, Miss Isabella	May 25, 1883	White, E. M.	Dec. 27, 1895
*Thompson, James	Mch. 4, 1868	White, Jarvis	
Thompson, James, Jr.	Nov. 26, 1875	*Williams, A. F.	June 28, 1881
*Thompson, Hon. J. W.	May 25, 1883	Williams, Prof.	Aug. 31, 1883
Thompson, Thomas	Nov. 26, 1875	Williamson, Prof. —, Rock Is- land, Ill.	Aug. 31, 1883
Thompson, William	May 25, 1873	Williston, Rev. M. L.	June 25, 1884
Tiffany, A. S.	Founder	Willrodt, L. H.	Feb. 23, 1877
Tillinghast, B. F.	May 25, 1883	Wing, George	Feb. 25, 1876
Tilton, J. C.	Apr. 27, 1883	Wing, J. Q.	May 28, 1880
*Tomson, Mrs. J. J.	May 25, 1883	Witherell, L. R.	Apr. 29, 1881
Tourtelotte, Henry	June 2, 1869	Wolcott, Prof. P. C.	Nov. 29, 1889
Tredick, A.	Jan. 8, 1806	Wood, George E.	Feb. 12, 1869
Truax, C. H., Maquoketa, Ia.	Apr. 27, '77	*Woodmansee, Ross	May 25, 1883
*True, D. S.	Dec. 14, 1867	*Woodward, B. B.	Aug. 31, 1877
*True, Mrs. D. S.	Sept. 2, 1877	*Worley, Dr. P. H.	Mar. 31, 1876
Twomey, D. H.	Jan. 28, 1876	Wylie, J. S.	June 29, 1883
Udden, Prof. J. A., Rock Island, Illinois	June 29, 1894	Wyman, Walter C., Chicago, Illinois	Dec. 26, 1884
Vander Veer, A. W.		Young, J. B.	Oct. 28, '69, Dec. 28, 1877
Van Patten, John P.	May 25, 1883	Young, Mrs. J. B.	Feb. 28, 1879
Vermillion, W. D.	Feb. 20, 1868	Zoeckler, John	Mar. 31, 1899
Vincent, C. S.	June 29, 1883		

## LIST OF LIFE MEMBERS

## WITH DATE OF ENROLLMENT.

Adams, Walker	Aug. 31, 1877	Cable, George W.	Oct. 31, 1884
Adams, Mrs. Walker	Aug. 31, 1877	Cable, George W., Jr.	Mch. 31, 1899
Andresen, H. H.	Jan. 28, 1881	Carl, E. S.	Oct. 31, 1884
Andresen, Richard	Mch. 31, 1899	Crossett, Edward Clarke	Mch. 31, 1896
Bahls, John	Oct. 3, 1877	Davis, Frank O.	
Baker, Dr. J. W. H.	May 25, 1883	Davison, Charles	Aug. 31, 1877
Balch, Frank A.	Oct. 2, 1877	Davison, Ella	Aug. 31, 1877
Ballard, Miss Bessie	Mar. 31, 1899	Donaldson, Dr. John B.	June 24, 1898
Barris, Prof. W. H.	Mch. 31, 1899	Dow, T. T.	Sept. 29, 1877
Brewster, W. C.	Dec. 17, 1877	Farquharson, Dr. R. J.	Mch. —, 1877
Brewster, Mrs. W. C.	Dec. 17, 1877	Fejervary, Mrs. Karoline	Aug. 31, 1877
Burdick, Anthony	Mch. 31, 1899	Ficke, C. A.	Mar. 31, 1899

Ficke, Mrs. C. A .....	Mar. 31, 1899	Pratt, W. H.....	Mar. 9, 1877
Flagler, Col. D. W., Rock Isl'd Arsenal.....	Apr. 25, 1879	Pratt, Mrs. W. H .....	Dec. 26, 1879
French, George H.....	Oct. 31, 1884	Price, Hon. Hiram .....	Mar. 31, 1899
French, Mrs. Geo. W. ....		Putnam, Benjamin R.....	Aug. 28, 1896
French, Robert T.....	Oct. 31, 1884	Putnam, Charles E.....	Mar. 6, 1877
Gass, Rev. J.....	Feb. 10, 1877	Putnam, Mrs. C. E.....	Mar. 6, 1877
Grant, Mrs. James.....	—, 1877	Putnam, Charles M.....	Mar. 6, 1877
Griggs, F. H.....	May 2, 1877	Putnam, Edward K.....	Jan. 5, 1898
Griggs, Thomas W.....	1899	Putnam, Elizabeth D.....	Mar. 6, 1877
Hall, Israel.....	July 27, 1877	Putnam, George R.....	Mar. 6, 1877
Hall, Capt. W. P.....	Aug. 11, 1877	Putnam, H. St. Clair.....	Mar. 6, 1877
Hall, Mrs. W. P.....	June 25, 1880	Putnam, John C.....	Mar. 6, 1877
Hall, Channing.....	Dec. 30, 1881	Pitnam, Joseph Duncan ..	Apr. —, 1876
Hall, Grace.....	June 25, 1880	Putnam, W. Clement.....	Mar. 6, 1877
Harrison, Charles E.....	Mar. 31, 1899	Renwick, James.....	May 2, 1877
Hazen, Dr. E. H.....	Mar. 17, 1877	Renwick, William .....	May 2, 1877
Hazen, Mrs. E. H.....	Mar. 17, 1877	Renwick, Mrs. William ..	May 2, 1877
Hunting, Rev. S. S.....	July 27, 1877	Renwick, William Godwin.	Mar. 31, 1899
Hunting, Mrs. S. S.....	July 27, 1877	Richardson, J. J.....	Mar. 31, 1899
Iles, Thomas, Jr.....	Mch. 31, 1899	Roberts, Edward C .....	Mar. 31, 1899
Kuhnen, Nicholas.....	Oct. 31, 1884	Roberts, Mrs. U. N.....	
Kuhnen, Nicholas, Jr.....	Oct. 31, 1884	Robinson, J. Frank.....	Mar. 31, 1899
Leonard, Miss Nellie.....	Mch. 31, 1899	Robinson, Capt. T. J.....	Mar. 29, 1878
Lynch, F. P.....	Dec. 8, 1877	Roddewig, Paulo .....	Mar. 31, 1899
Mandeville, Col. H. M.....	May 2, 1877	Rothschild, Isaac .....	Oct. 31, 1884
Mandeville, Mrs. H. M.....	May 2, 1877	Sheaff, Mrs. Isabella .....	Dec. 8, 1877
Marks, Mrs. M. L.....	Apr. 30, 1886	Sheldon, Prof. D. S.....	June 29, 1877
McClelland, George P ..	Oct. 17, 1877	Sheldon, Mrs. D. S.....	June 29, 1877
McClelland, Thomas W ..	Dec. 8, 1877	Sheldon, Miss Sarah Foote.	Aug. 25, 1882
McClelland, Mrs. T. W ..	Dec. 8, 1877	Sieg, Miss Alice .....	Dec. 26, 1884
Millar, Mrs. S. B. R.....	June 29, 1877	Smetham, Richard.....	Oct. 31, 1884
Miner, Mrs. Jennie True ..	Oct. 17, 1877	Smith, S. F .....	Aug. 31, 1877
Murphy, Hon. J. H.....	Oct. 31, 1884	Smith, Mrs. S. F.....	Aug. 31, 1877
Newcomb, Mrs. Patience V.	Feb. 23, '77	Spink, Henry .....	May 2, 1877
Parry, Dr. C. C.....	Aug. 31, 1877	Stuyvesant, M. L .....	Oct. 2, 1877
Parry, Mrs. C. C.....	Aug. 31, 1877	Stuyvesant, Mrs. M. L .....	Oct. 2, 1877
Parry, John E.....	May 30, 1879	Thompson, James .....	Oct. —, 1877
Parvin, Prof. T. S .....	Mar. 30, 1877	Van Patten, Miss Dorothy.	May —, 1884
Pendleton, E. H.....	July 27, 1877	Vollmer, Henry, Jr .....	Mar. 31, 1899
Pendleton, Mrs. E. H ..	July 27, 1877	Whitaker, Mrs. Lottie Hall.	Aug. 31, 1877
Phelps, J. B .....		Woodward, B. B.....	Aug. 31, 1877
Phelps, Mrs. J. B .....		Zoeckler, John.....	Mar. 31, 1899

## LIST OF REGULAR MEMBERS.

OCTOBER 1, 1899.

NAMES OF LIFE MEMBERS IN ITALICS.

Adams, Claude E.	<i>Donaldson, Dr. John B.</i>	<i>Iles, Thomas, Jr.</i>
<i>Adams, Mrs. Walker.</i>	Elmer, Dr. A. W.	Judy, Rev. A. M.
Albrecht, Otto.	<i>Ficke, C. A.</i>	Kerker, George W.
Allen, Dr. William L.	<i>Ficke, Mrs. C. A.</i>	<i>Kuhnen, Nicholas, Jr.</i>
<i>Andresen, H. H.</i>	Fidlar, Frank.	Lane, Mrs. James T.
<i>Andresen, Richard.</i>	Francis, Charles.	Lardner, James F.
Baker, Dr. Charles R.	French, George W.	<i>Leonard, Miss Nellie.</i>
Baker, Hon. George T.	French, Mrs. Frances M.	Lillis, William M.
<i>Baker, Dr. J. W. H.</i>	<i>French, Mrs. George W.</i>	Lindsay, J. E.
<i>Balch, F. A.</i>	French, Dr. L.	Lischer, Henry.
<i>Ballard, Miss Bessie.</i>	French, Hon. Nath'l.	Lorenzen, Jens.
Ballard, E. S.	Garstang, Frank W.	<i>Lynch, E. P.</i>
Barker, George J.	<i>Gass, Rev. J.</i>	<i>Mandeville, Mrs. H. M.</i>
<i>Barris, Prof. W. H.</i>	Geisler, Emil.	<i>Marks, Mrs. M. L.</i>
Bechtel, G. M.	Gould, Miss Ellen	Martin, A. Vere.
Beiderbecke, Charles.	<i>Grant, Mrs. James.</i>	Mason, James B.
Bemis, Fred P.	Green, Wesley.	Mason, John L.
Berwald, John.	<i>Griggs, F. H.</i>	Mast, C. A.
Block, Louis.	Griggs, Thomas W.	Matthey, Dr. Carl.
Borcherdt, Edward	Hageboeck, Dr. A. L.	Matthey, Dr. Henry.
Bowman, Dr. A. W.	<i>Hall, Channing.</i>	<i>McClelland, Thos. W.</i>
<i>Brewster, W. C.</i>	<i>Hall, Miss Grace.</i>	<i>McClelland, Mrs. T. W.</i>
<i>Brewster, Mrs. W. C.</i>	<i>Hall, Capt. W. P.</i>	McClelland, Wilson.
<i>Burdick, Anthony.</i>	<i>Hall, Mrs. W. P.</i>	McCowen, Dr. Jennie.
<i>Cable, George W.</i>	Hammatt, Edward S.	Middleton, Dr. W. D.
<i>Cable, George W., Jr.</i>	Hanssen, Louis.	Miller, Alonzo A.
Cantwell, Dr. A. W.	<i>Harrison, Charles E.</i>	Morrison, Right Rev.
Carl, E. S.	Harrison, Mrs. Chas. E.	Theodore N.
Claussen, William.	Harrison, J. H.	Mueller, Christian.
Cook, E. E.	Hass, J. H.	Nadler, Frank.
Crawford, Dr. J. P.	<i>Hazen, Dr. E. H.</i>	Newcomb, C. N.
<i>Crossett, Edw. Clarke.</i>	<i>Hazen, Mrs. E. H.</i>	Oberholtzer, Ernest C.
Crossett, E. S.	Heinz, Fred.	Osborn, Robert P.
Crossett, Mrs. E. S.	Helmick, John M.	<i>Parry, Mrs. C. C.</i>
Cutter, A. F.	Hender, W. H.	<i>Parry, John E.</i>
Daniel, Dr. Joseph A.	Henley, H. M.	<i>Parvin, Prof. T. S.</i>
<i>Davis, Frank O.</i>	Hill, Charles.	Paulsen, P. J.
<i>Davison, Charles.</i>	Hill, John.	Peck, Mrs. Maria Purdy.
<i>Davison, Miss Ella.</i>	Humphrey, Mrs. J. H.	<i>Pendleton, Mrs. E. H.</i>
Donahue, James P.	<i>Hunting, Mrs. S. S.</i>	<i>Phelps, J. B.</i>

<i>Phelps, Mrs. J. B.</i>	<i>Roberts, Horace.</i>	<i>Tabor, Ira R.</i>
<i>Pratt, Mrs. W. H.</i>	<i>Roberts, Mrs. U. N.</i>	<i>Thompson, Thomas.</i>
<i>Preston, Dr. C. H.</i>	<i>Robinson, J. Frank</i>	<i>Tillinghast, B. F.</i>
<i>Price, Hon. Hiram</i>	<i>Roddewig, Paulo.</i>	<i>Tredick, A.</i>
<i>Putnam, Benjamin R.</i>	<i>Rollins, Rev. Geo. S.</i>	<i>Udden, Prof. J. A.</i>
<i>Putnam, Mrs. Chas. E.</i>	<i>Rothschild, Isaac.</i>	<i>Vander Veer, A. W.</i>
<i>Putnam, Charles M.</i>	<i>Sanders, Miss Julia.</i>	<i>Van Patten, Miss Dor-</i>
<i>Putnam, Edward K.</i>	<i>Schlegel, Dr. E.</i>	<i>othy.</i>
<i>Putnam, Elizabeth D.</i>	<i>Schmidt, William O.</i>	<i>Van Patten, John P.</i>
<i>Putnam, George R.</i>	<i>Schroeder, Henry.</i>	<i>Vollmer, Henry.</i>
<i>Putnam, H. St. Clair.</i>	<i>Sheaff, Mrs. Isabella.</i>	<i>Vollmer, Henry, Jr.</i>
<i>Putnam, W. Clement.</i>	<i>Sheldon, Miss S. Foote.</i>	<i>Von Maur, Charles J.</i>
<i>Renwick, Miss Marg't.</i>	<i>Smith, S F.</i>	<i>Voss, Charles N.</i>
<i>Renwick, Miss Rebecca.</i>	<i>Smith, Mrs. S. F.</i>	<i>Wadsworth, Mrs. W. C.</i>
<i>Renwick, Mrs. William.</i>	<i>Smith, William G.</i>	<i>Whitcomb, E. H.</i>
<i>Renwick, W'm. Godwin.</i>	<i>Snider, W. H.</i>	<i>Whitaker, John H.</i>
<i>Richardson, J. J.</i>	<i>Spelletich, Michael.</i>	<i>Whitaker, Mrs. Lottie H.</i>
<i>Richardson, Mrs. J. J.</i>	<i>Starr, Prof. Frederick.</i>	<i>White, E. M.</i>
<i>Richardson, Morris N.</i>	<i>Stuyvesant, M. L.</i>	<i>Wylie, J. S.</i>
<i>Roberts, Edward C.</i>	<i>Stuyvesant, Mrs. M. L.</i>	<i>Zoeckler, John.</i>

In addition to the Regular and Life Members of the Academy, as given above, the following persons and firms have contributed generously to its support:

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<i>Armstrong, James, (New York).</i>	<i>Dow, T. T.</i>	<i>Hills, Mrs. H. H.</i>
<i>Barrette, Miss Lydia O.</i>	<i>Egbert, Fidlar &amp; Chambers.</i>	<i>Holmes, Miss Clara M.</i>
<i>Berryhill, Col. J. H.</i>	<i>Emerson, Edward.</i>	<i>Hombrecht, A.</i>
<i>Best, Louis P.</i>	<i>Fisher, Mrs. Matt.</i>	<i>Hosford, Mrs. E. C.</i>
<i>Brammer &amp; Ott.</i>	<i>Frahm, Henry.</i>	<i>Hughes, William.</i>
<i>Brockett, Mrs. P. E.</i>	<i>French, Miss Alice.</i>	<i>Jordan, N.</i>
<i>Bryant, S. P.</i>	<i>Fulton, A. C.</i>	<i>Kimball, A.</i>
<i>Burmeister, Christ.</i>	<i>Gaylord, T., (Cincinnati).</i>	<i>Kircher, Mrs. T.</i>
<i>Carpenter, Mrs. E. H., (Minneapolis).</i>	<i>Gifford, Mrs. I. L.</i>	<i>Koenig, Miss Emma.</i>
<i>Cleaves, Miss Ella.</i>	<i>Gilman, S. F.</i>	<i>Kohrs, Henry.</i>
<i>Cook, Mrs. E. E.</i>	<i>Gimbel, Joseph.</i>	<i>Krause, Robert.</i>
<i>Corbin, Austin, (N. Y.)</i>	<i>Grabbe, L.</i>	<i>Kulp, Dr. W. O.</i>
<i>Cosgrove, Bishop H.</i>	<i>Hancock, F. H.</i>	<i>Lauman, Charles, (Chicago).</i>
<i>Davies, Mrs. John L.</i>	<i>Hart, Mrs. C. W.</i>	<i>McCullough, Mrs. Thos.</i>
<i>Davison, Mrs. Abner.</i>	<i>Henry, George E., (Des Moines).</i>	<i>McCosh, J. K.</i>
<i>Deere, Charles.</i>	<i>Herrman, Mrs. Esther, (New York.)</i>	<i>Maehr, Frank.</i>
<i>Deere, Mrs. Charles.</i>		<i>Mosenfelder &amp; Kohn.</i>
<i>Dillon, Judge John F., (New York).</i>		<i>Newbold, Edward.</i>
		<i>Nutting, J. R.</i>

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Pickering, Charles.		Wadsworth, William.
Pierce, S. W.	Sieffert, H. O.	Warnebold & Wittenberg.
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Richardson, J. B.	Smetham, R.	Winecke, W. F.
Richter, T.	Smith, G. M.	Winslow, Mrs. —, (New York).
Roddewig, F.	Smith, Mrs. Mary White	
Rohlf, August.	Steffen, August.	
Ross, W. F.	Sudlow, Miss Phœbe.	
Runge, W. H.	Swiney, T. O.	

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Bull, Mrs. Mary Putnam (for publishing Proceedings) . . .	\$9,500	Parker, Mrs. J. M. (with interest to date) . . . . .	\$1,400
Kuhnen, Nicholas. . . . .	1,000	Citizens' contribution, 1877, . . . . .	
McIntosh, Robert. . . . .	250	(for building) . . . . .	5,000
Newbold, Edward. . . . .	1,200	Citizens' contribution, 1883. . . . .	1,200
Newcomb, Mrs. P. V. (lot) . . .	4,500	Citizens' contribution, 1898, . . . . .	
Parker, J. M. . . . .	1,000	(to purchase corner lot) . . . . .	2,800

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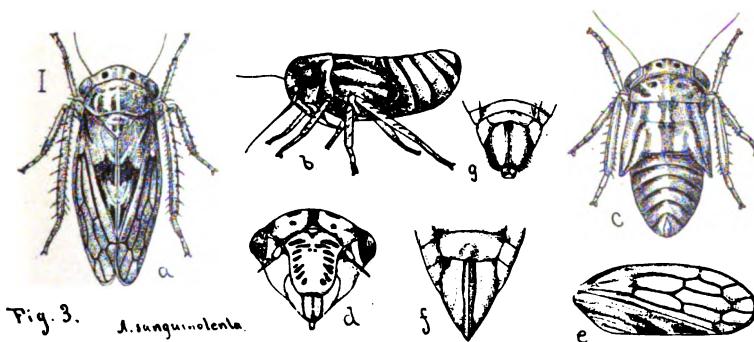
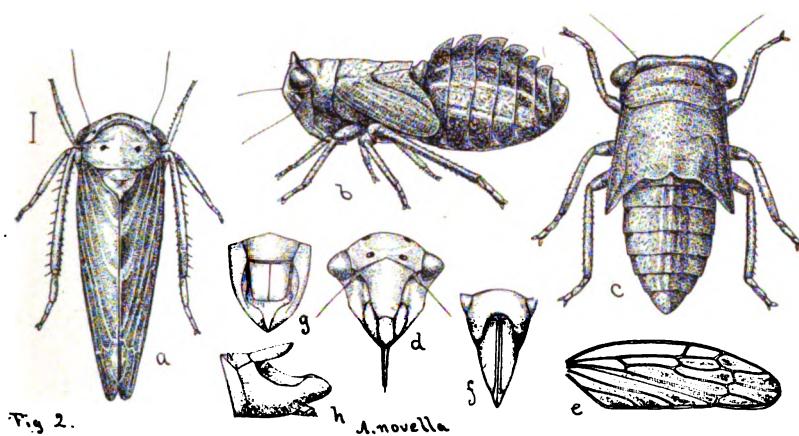
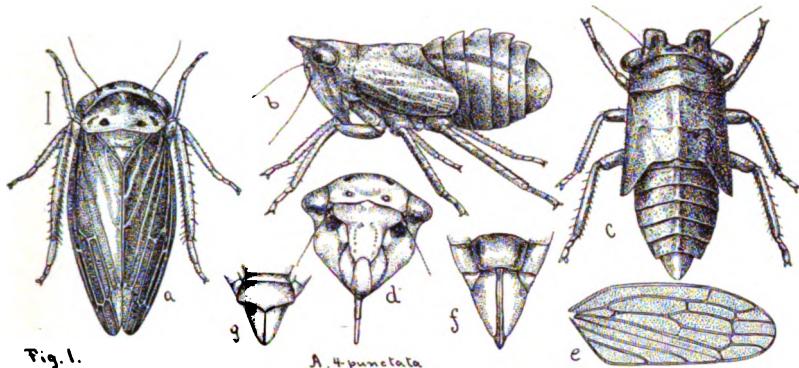
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## PLATE I.

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- Fig. 1. *Agallia punctata*; *a*, adult; *b*, larva, side view; *c*, larva, dorsal view; *d*, face; *e*, elytron; *f*, ♀, *g*, ♂ genitalia.
- Fig. 2. *Agallia novella*; *a*, adult; *b*, larva, side view; *c*, larva, dorsal view; *d*, face; *e*, elytron; *f*, ♀, *g*, ♂ genitalia; *h*, ♂, side view.
- Fig. 3. *Agallia sanguinolenta*; *a*, adult; *b*, larva, side view; *c*, larva, dorsal view; *d*, face; *e*, elytron; *f*, ♀, *g*, ♂ genitalia.







## PLATE II.

Fig. 1. *Macropsis apicalis*; *a*, adult; *b*, face; *c*, ♀, *d*, ♂ genitalia; *e*, larva; *f*, twig with eggs; *g*, egg, much enlarged.

Fig. 2. *Bythoscopus distinctus*; *a*, adult; *b*, face; *c*, ♀, *d*, ♂ genitalia; *e*, elytron; *f*, larva.

Fig. 3. *Pediopsis tristis*; *a*, adult; *b*, face; *c*, ♀, *d*, ♂ genitalia; *e*, larva.

Fig. 4. *Pediopsis ferruginoides*; *a*, adult; *b*, face; *c*, elytron; *d*, larva.

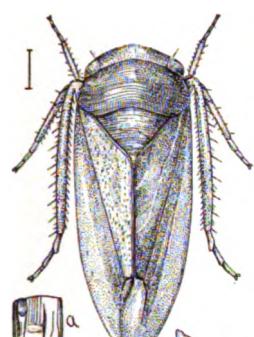


Fig. 1.

Mapcalis

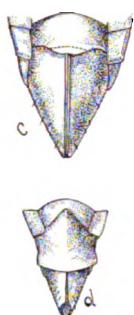
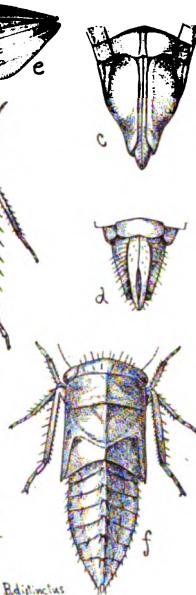


Fig. 2.



Padiocnemus

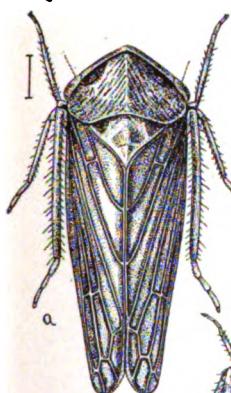
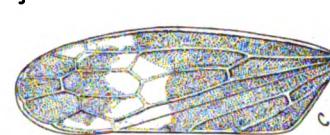
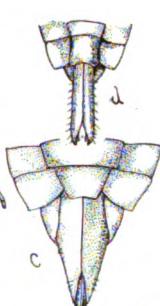


Fig. 3.

P. tristis



P. ferrugineoides

Fig. 4.

Osborn and Ball on Jassoldea.





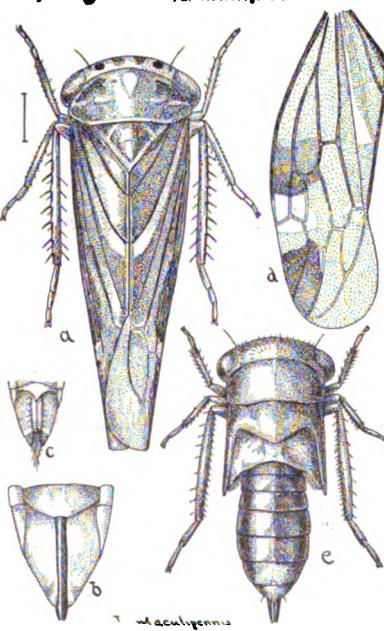
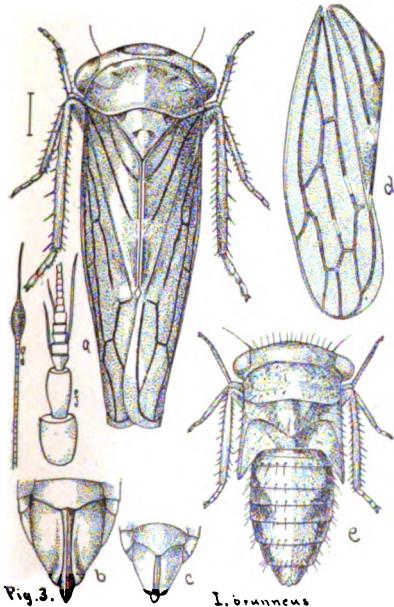
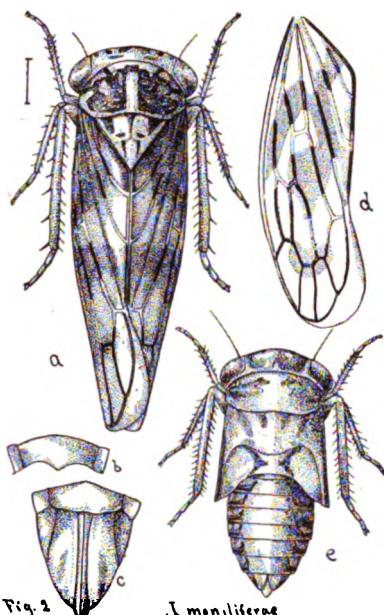
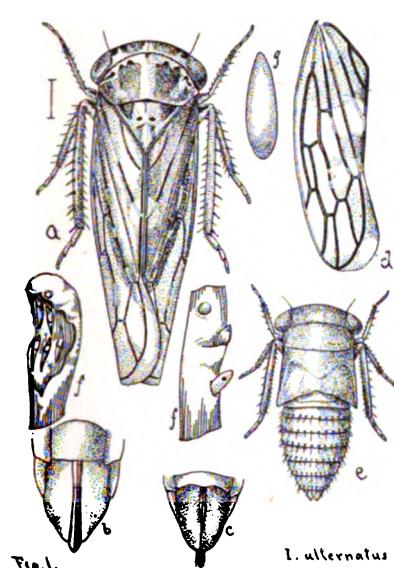
### PLATE III.

Fig. 1. *Idiocerus alternatus*; *a*, adult; *b*, ♀, *c*, ♂ genitalia; *d*, elytron; *e*, larva; *f*, twig showing eggs; *g*, egg, much enlarged.

Fig. 2. *Idiocerus moniliferæ*; *a*, adult; *b*, ♂, *c*, ♀ genitalia; *d*, elytron; *e*, larva.

Fig. 3. *Idiocerus brunneus*; *a*, adult; *b*, ♀, *c*, ♂ genitalia; *d*, elytron; *e*, nymph; *f*, base, *g*, apex of antenna.

Fig. 4. *Idiocerus maculipennis*; *a*, adult; *b*, ♀, *c*, ♂ genitalia; *d*, elytron; *e*, nymph.







## PLATE IV.

---

**Fig. 1.** *Lonatura (?) megalopa*; *a*, adult ♂; *b*, adult ♀; *c*, face; *d*, ♀, *e*, ♂ genitalia; *f*, elytron.

**Fig. 2.** *Lonatura catalina*; *a*, long-winged, *b*, short-winged ♂; *c*, short-winged ♀; *d*, face; *e*, ♀, *f*, ♂ genitalia; *g*, elytron; *h*, nymph.

**Fig. 3.** *Driotura gammaroidea*; *a*, short-winged, *b*, long-winged ♀; *c*, face; *d*, ♀, *e*, ♂ genitalia.

**Fig. 4.** *Driotura robusta*; *a*, short-winged ♀; *b*, face; *c*, ♀; *d*, ♂ genitalia; *e*, nymph.

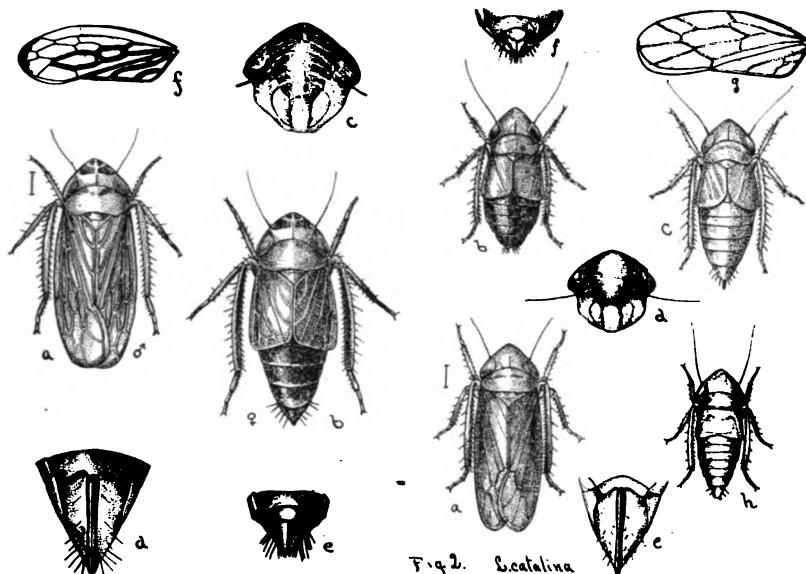


Fig. 2. *Scatalina*

*S. megaloptera*

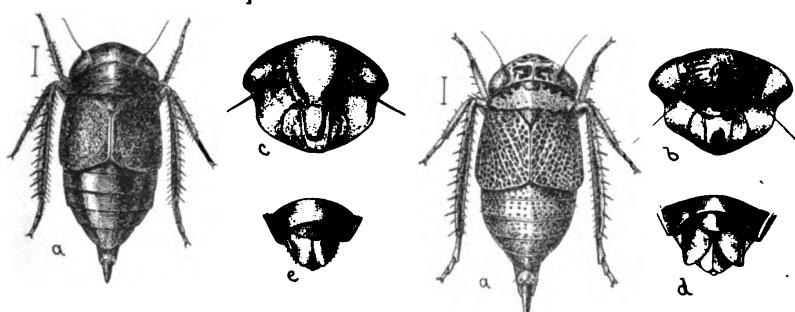


Fig. 3. *D. gammaroidea.*

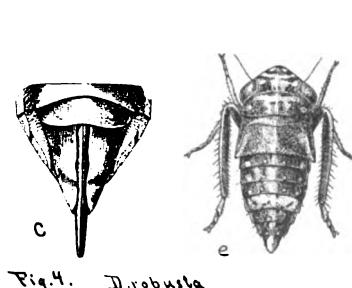


Fig. 4. *D. robusta*





## PLATE V.

Fig. 1. *Athysanus curtisii*; *a*, adult; *b*, face; *c*, ♀, *d*, ♂ genitalia; *e*, elytron; *f*, nymph.

Fig. 2. *Athysanus bicolor*; *a*, adult ♀; *b*, adult ♂; *c*, face; *d*, ♀, *e*, ♂ genitalia; *f*, elytron; *g*, nymph.

Fig. 3. *Athysanus striatulus*; *a*, adult; *b*, ♀, *c*, ♂ genitalia; *d*, elytron; *e*, nymph.

Fig. 4. *Athysanus striola*; *a*, adult; *b*, face; *c*, ♀, *d*, ♂ genitalia; *e*, elytron; *f*, nymph.

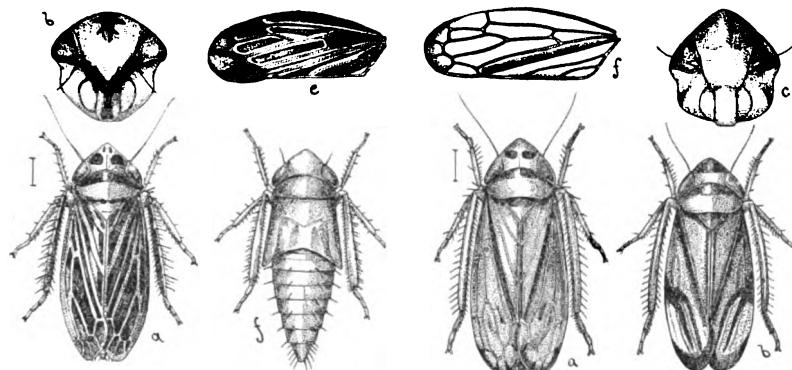


FIG. 1. *A. curtissi*

FIG. 2.

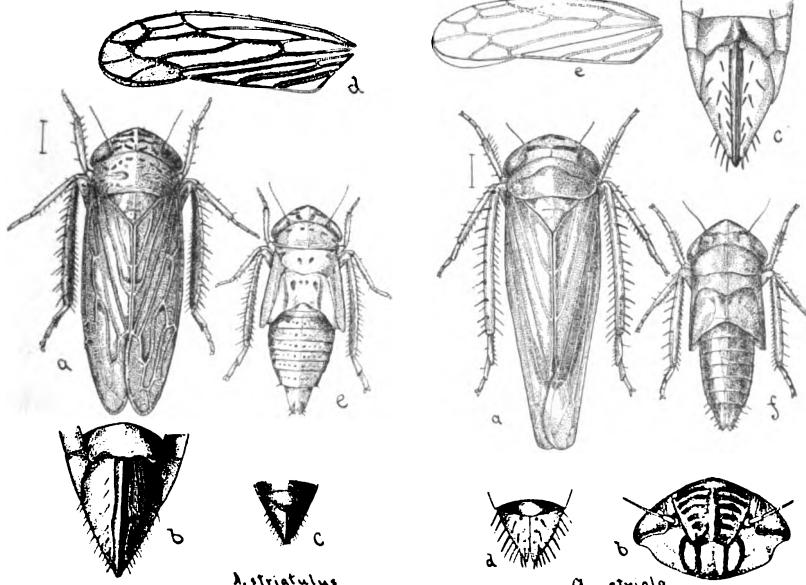


FIG. 3.  
Osborn and Ball on Jassoidea.

FIG. 4.





## PLATE VI.

Fig. 1. *Athysanus extrusus*; *a*, short-winged ♀; *b*, ♀; *c*, ♂ genitalia; *d*, nymph.

Fig. 2. *Dorycephalus vanduzei*; *a*, adult ♀, brachypterus; *b*, face; *c*, side view of head; *d*, ♀ genitalia; *e*, elytron; *f*, leg.

Fig. 3. *Phlepsiuss altus*; *a*, adult; *b*, face; *c*, ♀, *d*, ♂ genitalia; *e*, elytron; *f*, nymph.

Fig. 4. *Phlepsiuss nebulosus*; *a*, adult; *b*, face; *c*, ♀, *d*, ♂ genitalia; *e*, nymph.

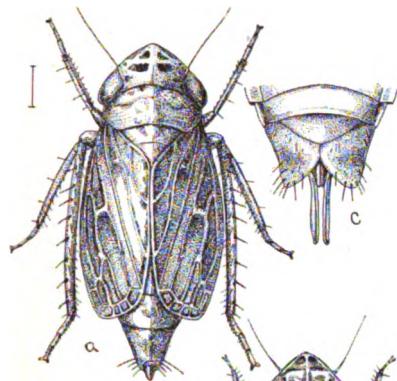


Fig. 1. *Acanthosus*

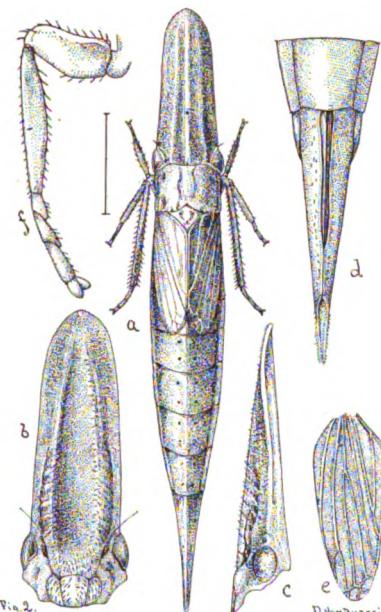


Fig. 2. *Dolichoderus*



Fig. 3. *P. altus*

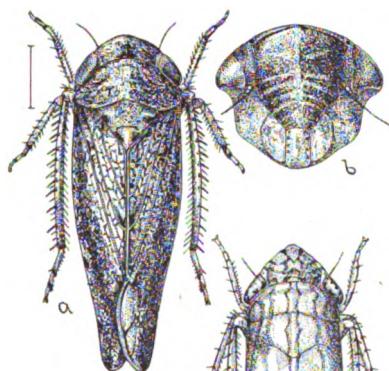
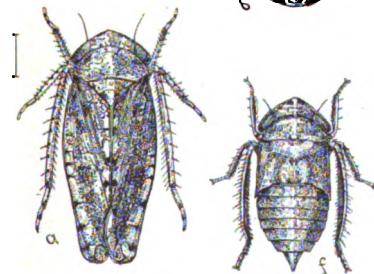
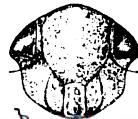
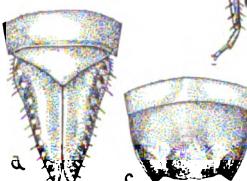


Fig. 4.



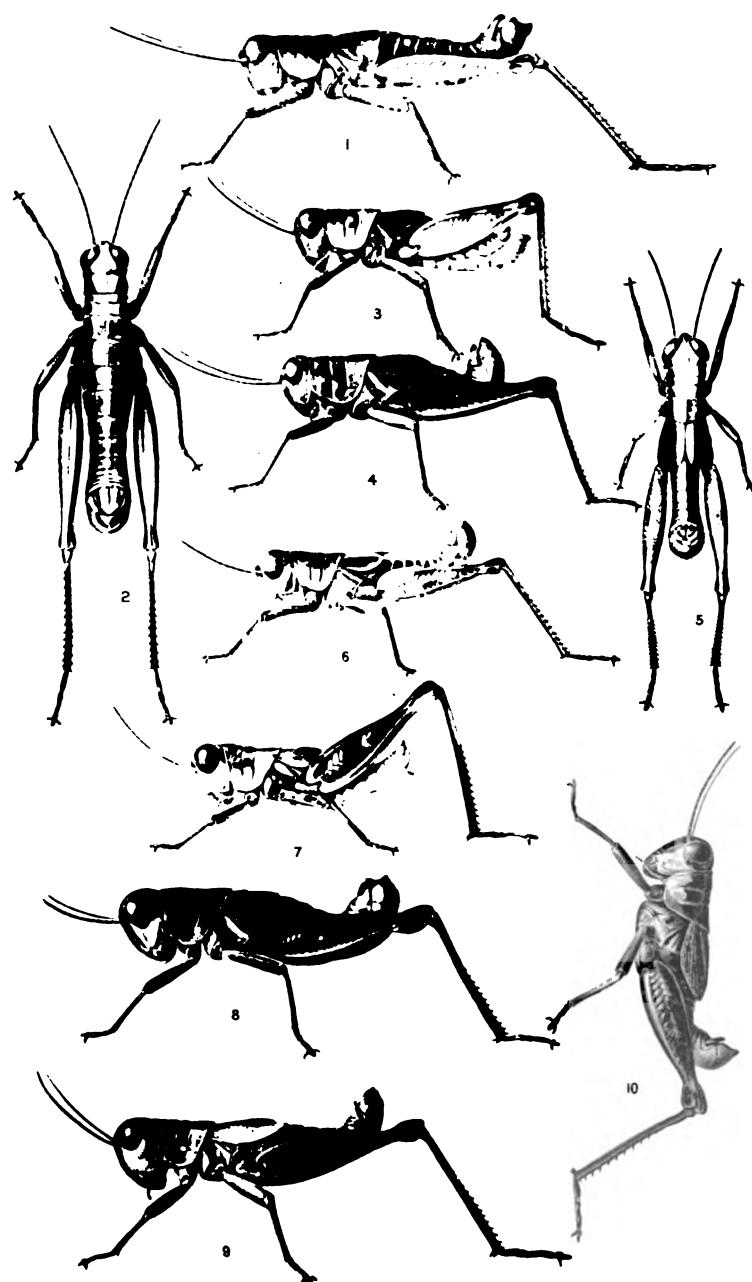
*P. nebulosus*

Osborn and Ball on Jassoidea.

## PLATE VII.

All the figures are magnified two diameters.

- Fig. 1. *Podisma polita*, ♂, side view. Divide, Oregon.
- Fig. 2. *Podisma polita*, ♂, top view. Same specimen as Fig. 1.
- Fig. 3. *Melanoplus blandus*, ♂, side view. Summit of Mt. Wilson, Altadena, Cal.
- Fig. 4. *Melanoplus femur nigrum*, ♂, side view. San Francisco Mts., Arizona.
- Fig. 5. *Melanoplus varicus*, ♂, top view. Tehachipi, Cal.
- Fig. 6. *Melanoplus varicus*, ♂, side view. Same specimen as Fig. 5.
- Fig. 7. *Melanoplus pinctus*, ♂, side view. San Diego, Cal.
- Fig. 8. *Melanoplus truncatus*, ♂, side view. San Francisco Mts., Arizona.
- Fig. 9. *Melanoplus phoebalotiformis*, ♂, side view. Gazelle, Cal.
- Fig. 10. *Melanoplus incultus*, ♂, side view. Larimer Co., Col.



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\* Harry Blaker, ad act.

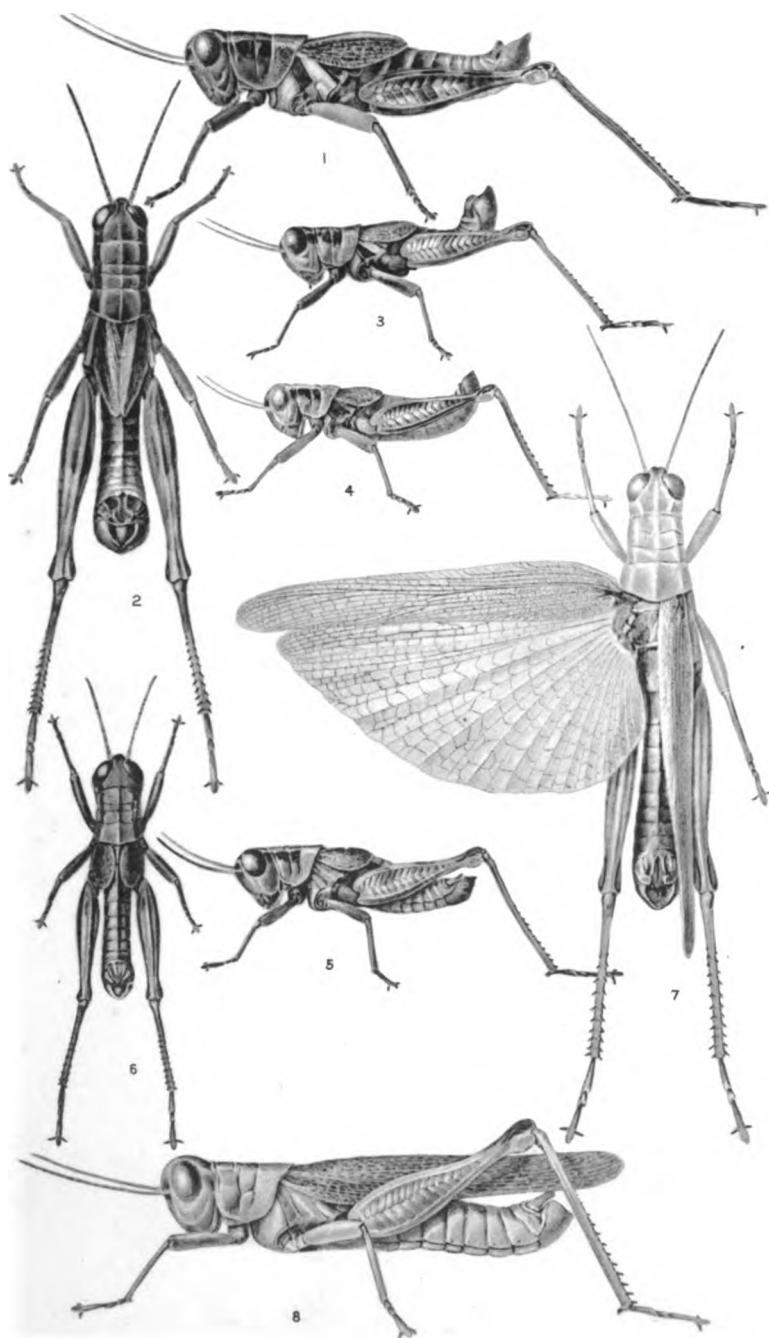




## PLATE VIII.

All the figures are magnified two diameters.

- Fig. 1. *Melanoplus franciscanus*, ♂, side view. San Francisco Mts., Ariz.
- Fig. 2. *Melanoplus franciscanus*, ♂, top view. Same specimen as Fig. 1.
- Fig. 3. *Melanoplus ablutus*, ♂, side view. Wawona, Cal.
- Fig. 4. *Melanoplus nanus*, ♂, side view. Berkeley, Cal.
- Fig. 5. *Melanoplus lignicolus*, ♂, side view. Benicia, Cal.
- Fig. 6. *Melanoplus ligneolus*, ♂, top view. Same specimen as Fig. 5.
- Fig. 7. *Melanoplus dealbatus*, ♂, top view. Ceres, Cal.
- Fig. 8. *Melanoplus dealbatus*, ♂, side view. Ceres, Cal.



Caudell—Supplement to Revision of Melaephilus.

J. Henry Blake, ad nat.





## PLATE IX.

All the figures are magnified two diameters.

- Fig. 1. *Melanoplus pilatus*, ♀, top view. Near Ft. Collins, Col.
- Fig. 2. *Melanoplus pilatus*, ♀, side view. Same specimen as Fig. 1.
- Fig. 3. *Melanoplus ascensus*, ♂, side view. Mt. Shasta, Cal.
- Fig. 4. *Melanoplus validus*, ♂, side view. Grant's Pass, Oreg.
- Fig. 5. *Melanoplus validus*, ♂, top view. Same specimen as Fig. 4.
- Fig. 6. *Melanoplus algidus*, ♂, side view. Mary's Peak, Benton Co., Oreg.
- Fig. 7. *Melanoplus debilis*, ♂, side view. Ashland, Oreg.

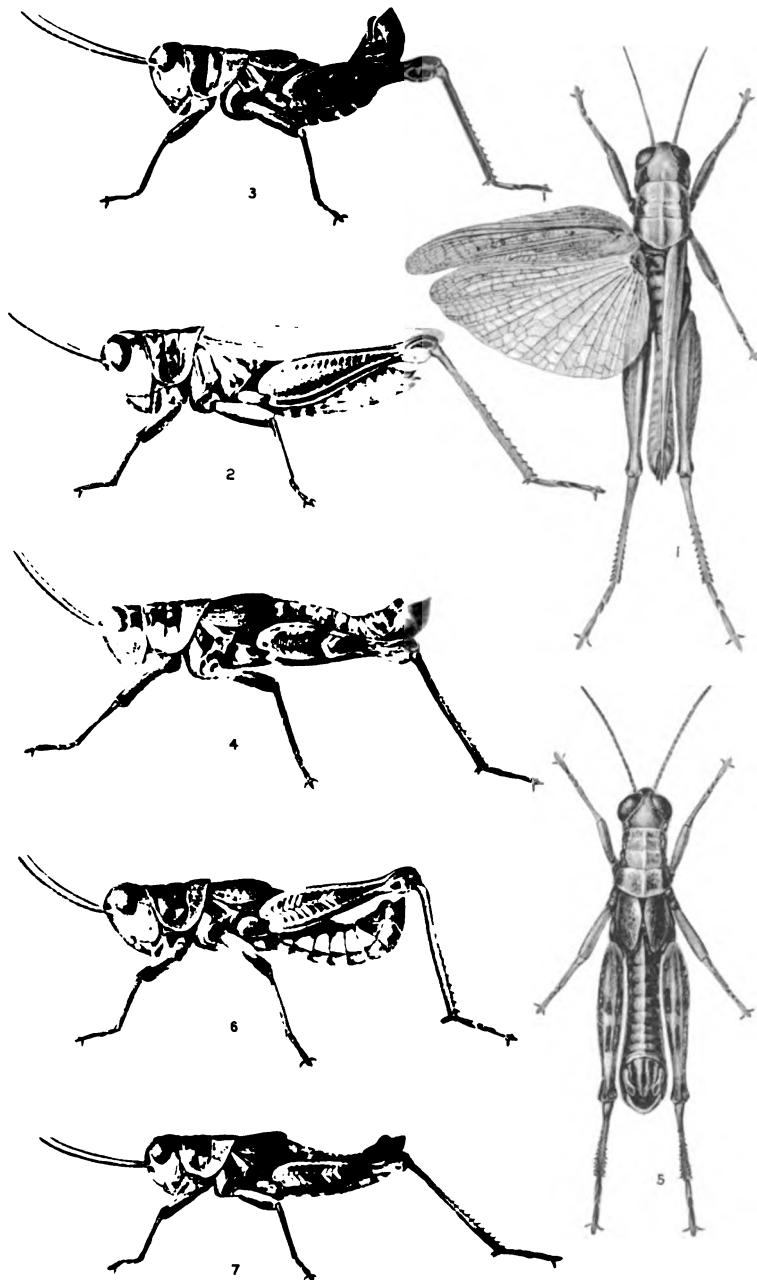






PLATE X.

Fig. 1. *Schenonnardus paniculatus* Trelease.

Fig. 2. *Bouteloua oligostachya* Torr.

Fig. 3. *Agropyron spicatum* S. & S.



PLATE XI.

Fig. 1. *Poa Wheeleri* Vasey.  
Fig. 2. *Calamagrostis purpurascens* R. Br.  
Fig. 3. *Savastana odorata* Scribn.

TYPICAL HIGHER ALTITUDE GRASSES OF LOW GROUND.

Plate XI.

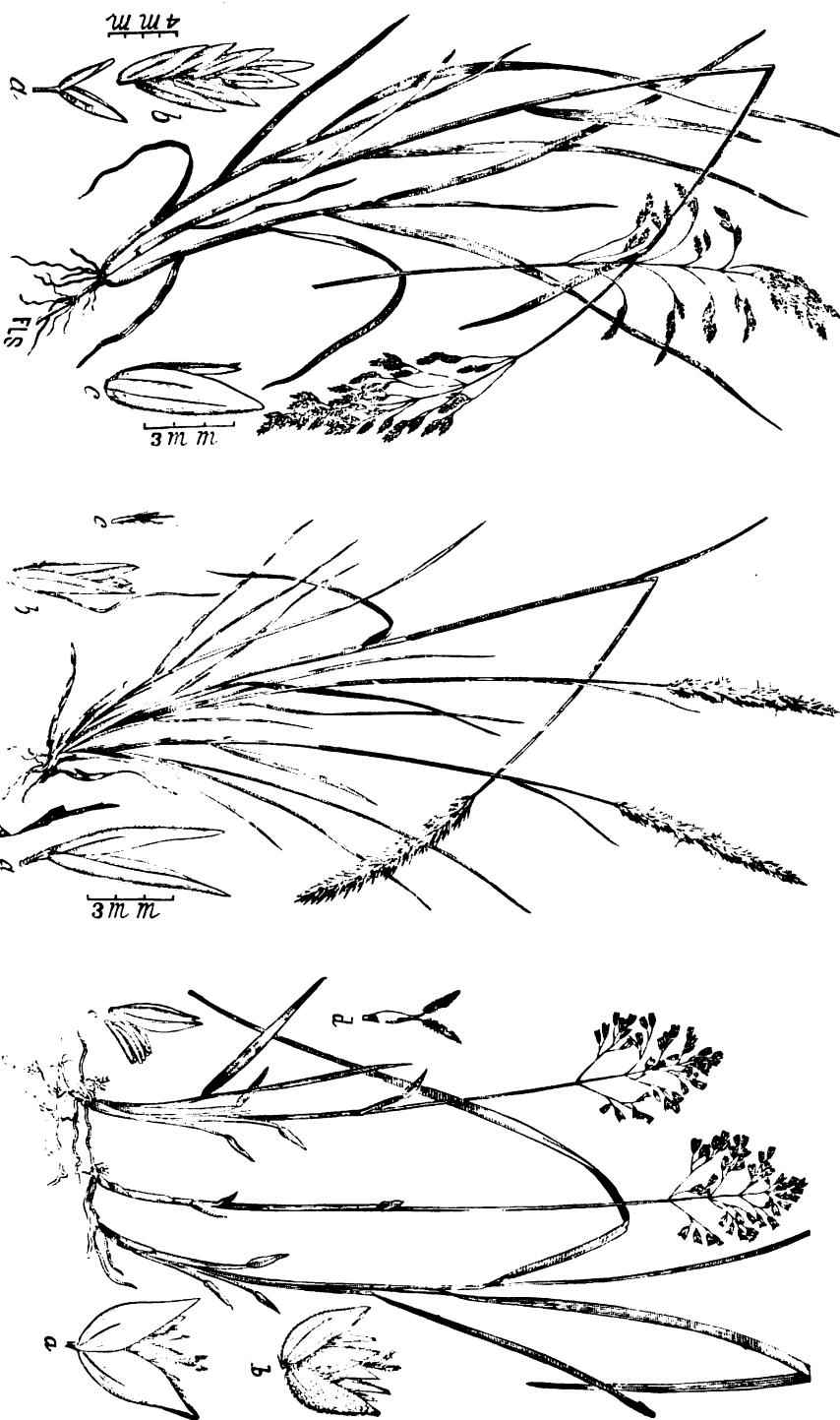
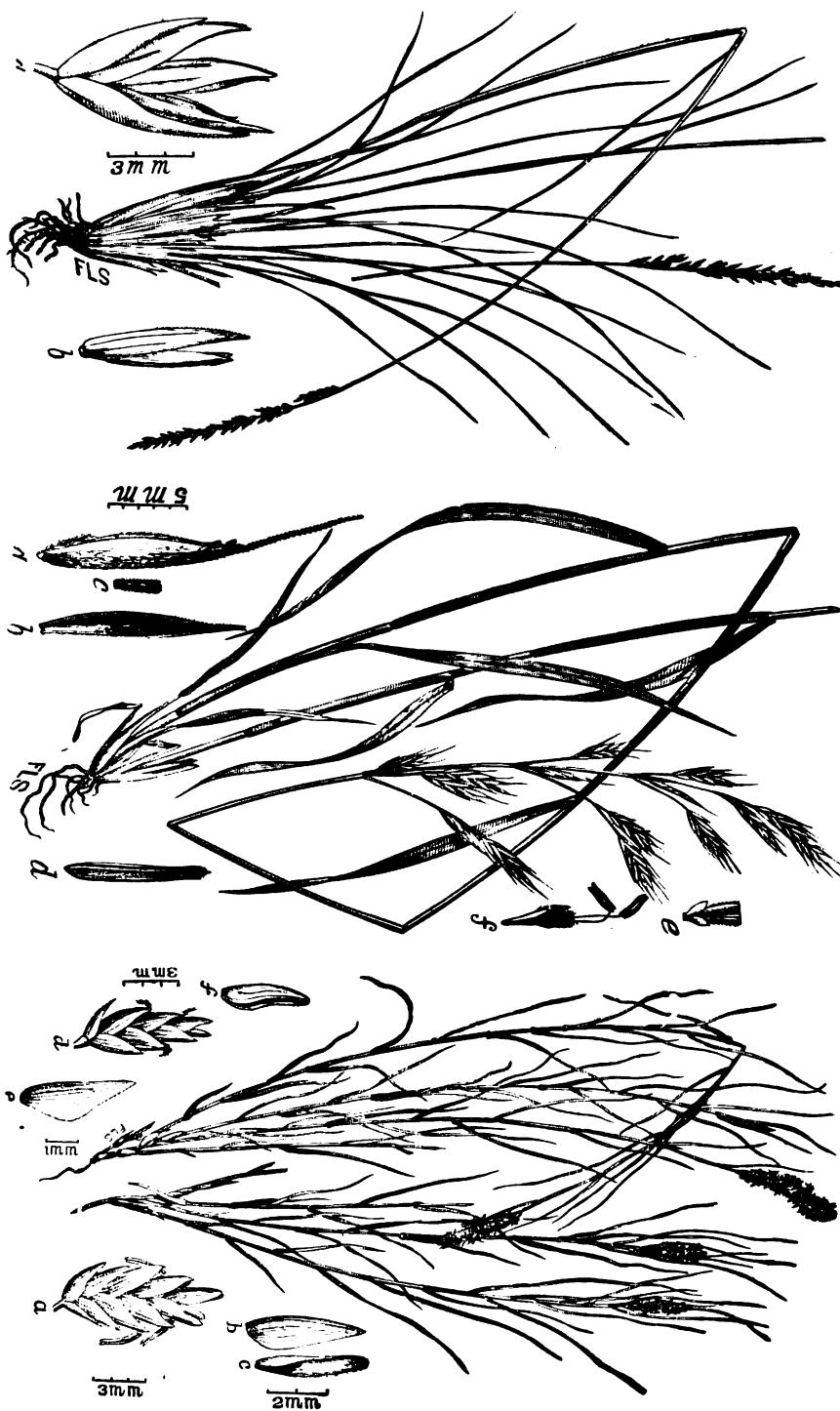


PLATE XII.

Fig. 1. *Festuca Kingii* Scribn.  
Fig. 2. *Bromus breviaristatus* Buckley.  
Fig. 3. *Distichlis spicata* Greene.



**PLATE XIII.**

Fig. 1. *Eriocoma cuspidata* Nutt.

Fig. 2. *Hordeum jubatum* L.

Fig. 3. *Stipa comata* Trin. & Rupr.

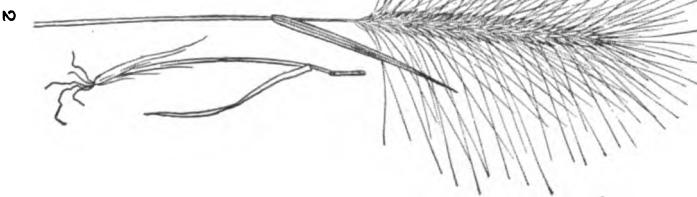
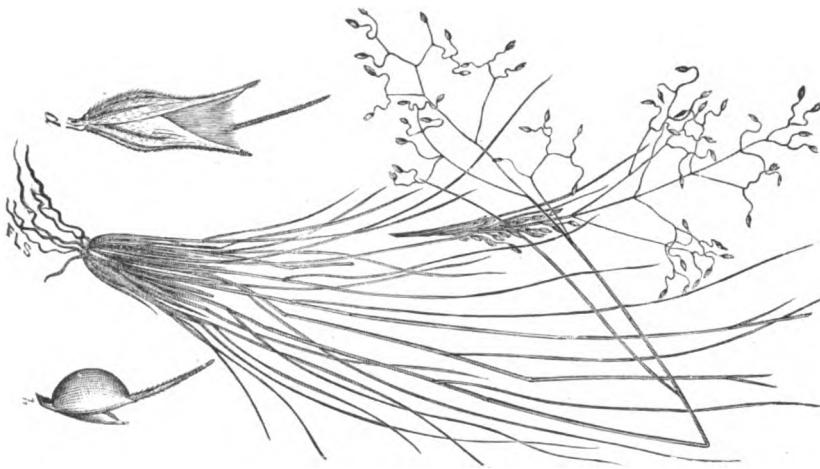


PLATE XIV.

Fig. 1. *Phleum alpinum*, showing general habit of the plant and a spikelet with flower displayed.

Fig. 2. *Phleum alpinum* var. *Scribnérianum*, showing general habit of plant and spikelet with flower displayed.



PLATE XV.

Fig. 1. *Melica subulata*, showing general habit of plant with spikelet to the right.

Fig. 2. *Melica spectabilis*, with spikelet to the right.

Fig. 3. *Melica Pammelii*, with spikelet to the right.



1

2

3

PLATE XVI.

Showing a view of landscape in the region of Dome Lake, Dome Rock in the distance. One of the numerous small lakes shown at the base of the hills near the margin of a pine swamp. Most of the trees consisting of *Pinus Murrayana* and a few *Picea Engelmannii*. The forest only partially destroyed by fire. Grassy meadow surrounding the lake. Drawing made by Miss King from a photograph.

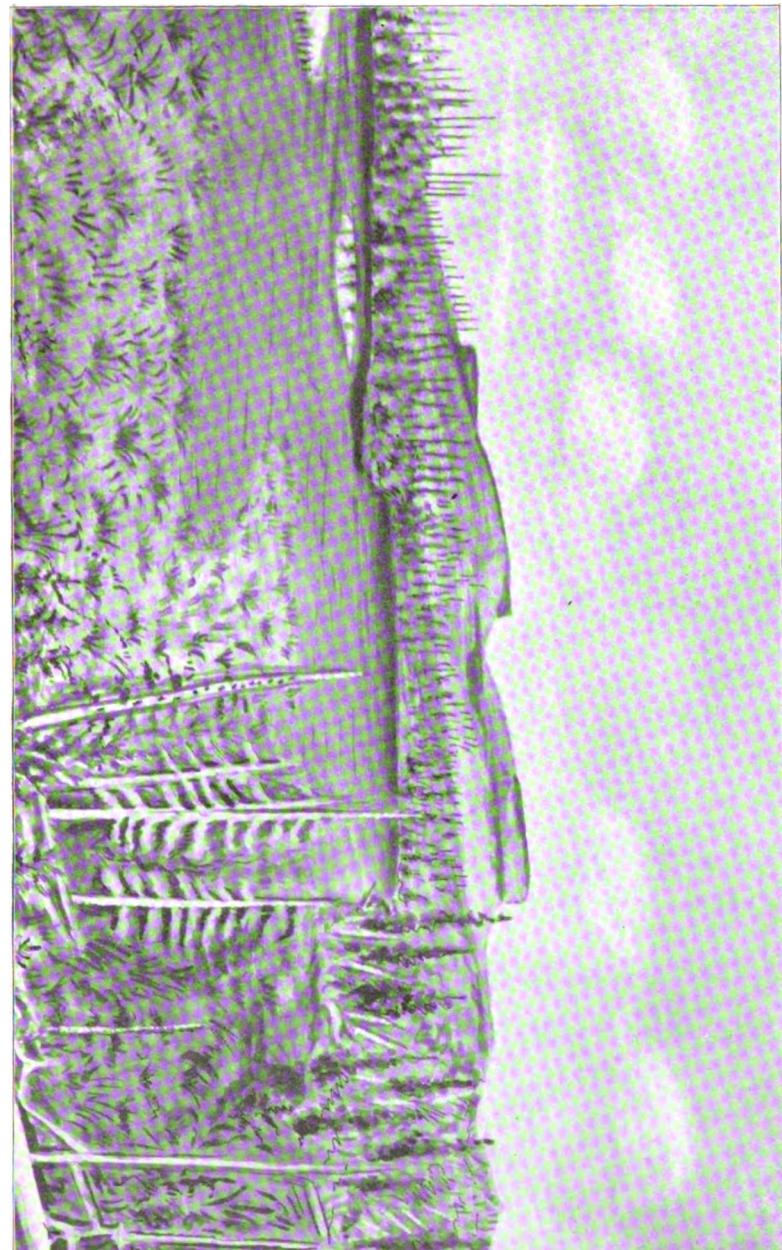
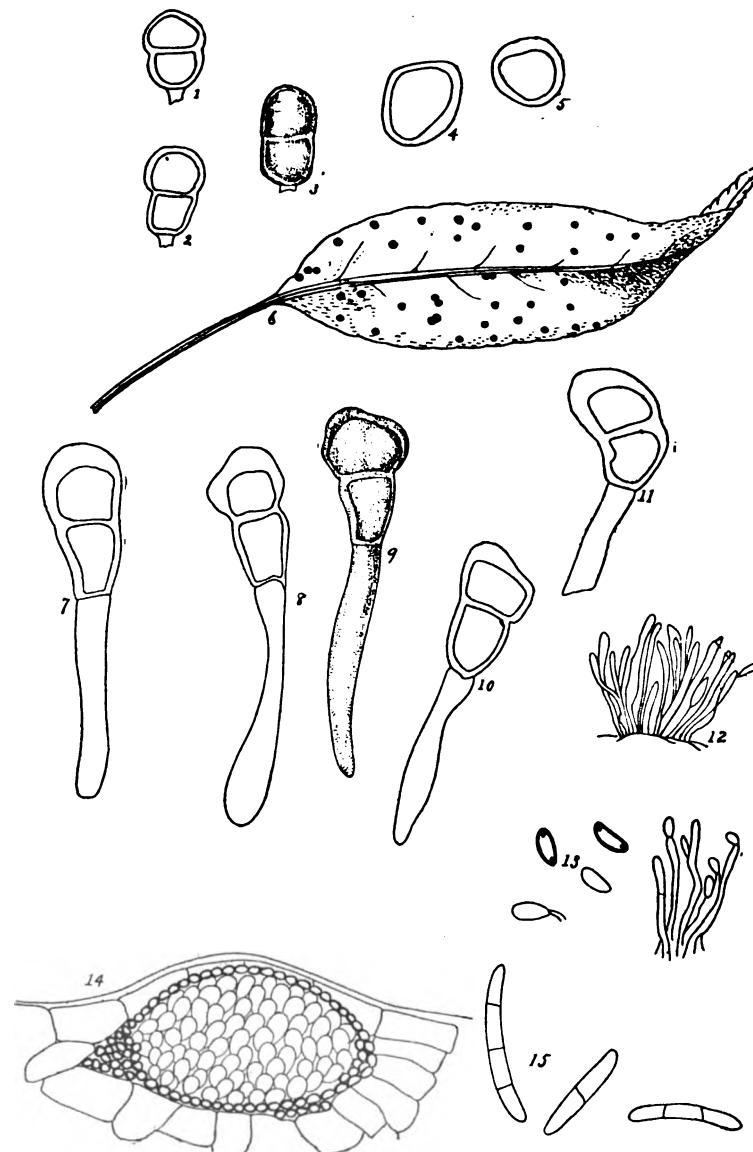


PLATE XVII.

Fig. 1-3. Teleutospores of *Puccinia uniformis* n. sp.  
Fig. 4-5. Uredospores of *Puccini uniformis*.  
Fig. 6. Leaf of *Rumex paucifolius*, showing soil.  
Fig. 7-11. Teleutospores of *Puccini Crandallii* n. sp.  
Fig. 12. Conidiophores of *Microstroma americanorum* n. sp.  
Fig. 13. Conidia of *Microstrisna americanorum*.  
Fig. 14. Optical view of *Septoria Jamesii* n. sp.  
Fig. 15. Spores of *Septoria Jamesii*.







# PUBLICATIONS

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